ESSAYS

ON

MALARIA, AND TEMPERAMENT.

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LEXINGTON, KENTUCKY.
PRINTED BY N. L. FINNELL & J. F. HERNDON.
1831.

PRIZE ESSAY ON MALARIA.

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REPORT OF THE "PRIZE ESSAY" COMMITTEE.

At the Annual Convention of the MEDICAL AND CHIRURGICAL FACULTY OF MARYLAND, *held in Baltimore, June 6th*, 1831, *the following report was submitted by the Prize Essay Committee, and accepted by the Convention.*

JOHN FONERDEN, *Rec. Sec.*

The Committee appointed by the Medical and Chirurgical Faculty of Maryland, at the last convention to award the medical prize—

Report, That in the performance of their duty, they selected for the subject of the Prize Essay, "*The nature and sources of* MALARIA, *or noxious miasma, from which originate the family of diseases, usually known by the denomination of bilious diseases; together with the best means of preventing the formation of malaria, removing their sources, and obviating their effects on the human constitution, when the cause cannot be removed.*" As was expected, from the great importance of the question, many highly respectable essays were presented. Several of them deserve special commendation for ingenuity and research. Your committee, in the execution of their assigned duty, have adjudged the prize to that bearing the superscription—

"Dies errorem delet, veritatemque illustrat."

The committe, however, respectfully suggest that the other competitors for the prize be requested to give publicity to their productions. The subject of malaria is one of great concern to the world at large, and the results of concentrated investigation are too valuable to be lost, when so much information remains unsupplied. CHARLES CALDWELL, M. D. of Kentucky, is the author of the successful essay.

THOMAS E. BOND, M. D.
JOHN BUCKLER, M. D.
JOHN FONERDEN, M. D.
H. WILLIS BAXLEY, M. D.
EDMUND G. EDRINGTON, M. D.
JOHN L. YEATES, M. D.
PETER SNYDER, M. D.

PRIZE ESSAY.

An "Essay upon the nature and sources of the Malaria, or noxious miasma, from which originate the family of diseases usually known by the denomination of bilious diseases; together with the best means of preventing the formation of Malaria, removing the sources, and obviating their effects on the human constitution, when the cause cannot be removed."

Offered as a "Prize Essay," according to the conditions prescribed by "The Medical and Surgical Faculty of Maryland, at their annual convention held in the city of Baltimore, on the 7th and 8th of June, 1830."

Dies errorem delet, veritatemque illustrat.

INTRODUCTION.

NO age within human remembrance, or the reach of history, has been so fruitful as the present, in schemes for the improvement of the condition of man. Nor have the efforts of former times, to this effect, been so generally successful, as many of those that have been more recently instituted; a proof that the true interests of our race, and the means of promoting them are becoming bet-

ter known. Indeed usefulness of design, and a practical character and tendency in all things, as contrasted with the abstraction and hypotheses of former periods, constitute one of the most prominent features of the day, and mark, in a special manner, the projects of our own country. Mere beauty and ingenuity, however pleasing to the few, have but little attraction for the great mass of the American people. Preferring the fruit to the blossom, their delight is in something useful. Whether they make, at times, an excessive sacrifice of embellishment to usefulness, it is not my province, at present, to decide.

The deepest interest that man has at stake, is in the right cultivation of his intellect and morals. Let that be attained, and carried as far as his faculties admit, and all that is most desirable to him will grow out of it. While it furnishes him with knowledge to direct him in the transaction of affairs, both public and private, it strengthens his motives to the practice of virtue, and the promotion of general and individual happiness. When

raised to this condition, he has no further improvement, as respects his mind, to look or wish for, in his present state of existence.

Second only, as a matter of interest and a means of usefulness, to a sound and well disciplined intellect, is a healthful and vigorous body. Were I to say that the two are inseparable, facts would not be wanting to confirm the position. An entire person, including the brain and nerves, well formed and organized, and in a condition of health, is never unaccompanied by a sound mind; and the reverse. If the body be seriously diseased, or defective in any of its fundamental organs, the mind participates in the malady or privation. It may be, therefore, laid down as a maxim, sustained alike by observation and principle, that *mens sana* is to be found only in *corpore sano;* a consideration which adds incalculably to the value of health.

Yet, singular as it may appear, it is notwithstanding true, that mankind set but a moderate estimate on this invaluable blessing. Such, at least, as relates to the protection of

it, is the only rational interpretation their conduct can receive. Hence the recklessness with which they risk it, and the innumerable instances in which they sacrifice it, on trivial points, for momentary gratifications, and in useless and degrading practices. In projects of ambition, wealth, or pleasure, there is nothing too difficult or dangerous, for aspiring minds, and bold and ardent spirits to encounter. Yet, to preserve health, without which success is joyless, hope sickens, and life is a burden, they will neither incur trouble, nor forego gratification. They will not even so far control their appetites, as to satisfy them with food and drink like rational beings, but, with the heedlessness and voracity of inferior animals, swallow, in quantity and quality, what their experience a thousand times repeated, has proclaimed to be fraught with the seeds of disease. Nor will they deny themselves the pleasure to be derived from a crowded evening party, an interesting excursion, or any other scene of amusement, although admonished almost to assurance, by

the past, that the indulgence will visit them with a fit of sickness.

But neglectful of health as individuals are, public bodies are still more so. The sentiment has become a proverb, that "Corporations never feel." Were another formed, declaring that, as relates to health, they "never think," it would be scarcely less true. On that subject they have hitherto done little else than indulge their fears and exercise their imaginations, or collect antiquated prejudices, obsolete hypotheses, and opinions at open war with science, and, weaving them into statutes, miscall them health laws. They certainly therefore think on it to very little purpose. Quarantine establishments founded in error, and ill-contrived schemes for purifying cities excepted—both of which, as now conducted, do more harm than good—it is not within my recollection, that states have devised and put in practice any measures of moment for the *preservation* of the public health. The ordinances which corporations occasionally pass to guard against small pox, canine mad-

ness, and a few other maladies, are unworthy of notice. Almost all that has been done by vaccination for the prevention of the former complaint, has been the work of individuals. And it is matter of regret, that even that has been overvalued. At any rate, it does not amount to the preservation of health. It is only the substitution of one disease for another—a less evil for a greater. Even that, however, is a deduction from the sum of human misery, and is so far to be commended and encouraged. Vaccination moreover mitigates small pox, if it does not always prevent it.

States and corporations have indeed done much for the *restoration* of health when lost, and the alleviation of disease and injury, when too deep to be cured. Some of the most invaluable, I had almost said glorious establishments on earth, are public hospitals. No one can visit those of London and Paris, and other large European cities, without receiving an impression to this effect, which no time can erase. Nor has our own country.

or rather the people of it, been unmindful of them. Some of the hospitals in the United States would be distinguished, if not for their size, at least on account of their excellent administration, in the great capitals of which I have spoken. But they are not, I repeat, the work of states, or other public bodies. They are the product chiefly of a more sacred and endearing source, the munificent charities of benevolent individuals. As far as I am informed, neither the nation nor the individual States of America have done any thing for hospitals that deserves high commendation. Considering their means, and the nature and strength of the claims on them for aid, the donations they have occasionally made have been any thing but liberal. A more severe and narrow policy, not to call it unjust, can scarcely be imagined, than that of the government of the United States, in withholding from mariners a portion of their wages, to provide accommodations for them, in case of sickness. There is a frigidness in it, united to an act of heartless authority, that

chills and offends, and seems to proclaim to the world, that the fountains of our public munificence and benevolence are frozen up; that, as a nation, we look only to the future, forgetful of the past, and do every thing for interest, and nothing for gratitude. Our seamen toil for their country, and give her wealth, fight her battles, and glorify her flag. In return for this, they are richly entitled, free of expense, to comfortable quarters, during suffering from sickness and wounds, and the infirmities of age. On these points the conduct of the British government is worthy of all praise and imitation. The mariners that have been the main prop of Britain's power, by ministering to her opulence, and giving her the empire of the seas, are objects of her tenderest regard in the hour of distress. They can point, as they glide along the Thames, to the groves and magnificent edifices of Greenwich, and claim them as their own—the glorious reward, from a just and grateful government, for dangers encountered, and services performed. Nor, in conferring such a

reward, has the government manifested less of sound policy, than of correct feeling. But to return from this digression.

I have alleged that the process of vaccination has not conferred on man the full amount of benefits that were anticipated from it, or that report has ascribed to it. It has not, as many of its advocates so confidently predicted it would, erased small pox from the catalogue of disease. Nor is there the least probability that it ever will. The positive benefits, moreover, of vaccination, are diminished not a little, by the well known fact, that under inoculation skilfully conducted, small-pox is a disease not much more severe and dangerous than cow-pox. I know that a belief the contrary of this very generally prevails. But that does not move me, because it does not constitute authentic testimony. My reliance is on observation and experience, not on popular opinion; on what I have myself seen, not on what I have only heard or read. Out of several hundred children that I have inoculated, but *one* died of the complaint; and

that was a child whose constitution was so infirm that I communicated the disease to it with great reluctance, and warned its parents of the danger of the operation. Let the weather be temperate, the atmosphere free from any endemic or epidemic taint, and the child healthy; in an especial manner, let its *chylopoetic organs* and *skin* be in a sound condition, and I repeat, that the danger from inoculation, under skilful management is far from being serious. Severe cases arise much more from some sort of mismanagement, than from the nature of the disease. Nor is it within my recollection that the face of a single child I ever inoculated was pitted by the pustules. I am sure the beauty of the countenance was never marred by them. By judicious treatment, that effect can be prevented. But let it not be imagined that I am an enemy to vaccination. Far from it. The practice of my life has proved the contrary. I am willing to take the discovery for what it is worth; but for no more. And it is not worth the price that has been set on it. Extrava-

gant praise never fails to injure its subject.

But admit that small-pox had been exterminated, and its virus destroyed by means of vaccination. The event would have been surely of great value, and a source of high and well founded rejoicing to the human family. But it would not have been the *most* valuable that might have occurred. A febrile poison of much elder date, greater power, and wider compass, would have still remained, to baffle, for a time, the efforts of science, and continue, as it long has done, one of the heaviest scourges of the human race. I allude to the malaria productive of bilious fever; that miasm, whose nature, origin, and prevention, with the best mode of obviating its action on the system of man, are to constitute the subject of this dissertation.

It has just been observed that the miasm of bilious fever is a much more ancient evil than the matter of small-pox. For proof of this, reference may be had to general history and the records of our profession. The latter poison can be traced through the annals

of medicine only to the sixth or seventh century. But the former is coeval with the present order of things. Its birth was no doubt anterior to that of man. Ever since vegetable substances, such as now cover the earth, lived, grew, died, and passed to dissolution, its production was as necessary a result of the laws of nature, as the descent of ponderous bodies, or the refraction of light. Our records of it, moreover, extend to a period of great antiquity. Every fact and consideration that bear on the subject concur in proving, that it is the miasm of the true plague of Asia and Africa, no less than of the bilious and yellow fevers of Europe and America. That, in fact, it is the cause of the diseases of hot weather, through all time, by whatever names those maladies may be known. We clearly trace its being and ravages, therefore, to the days of Sesostris, Busiris, and the Pharoahs. It was the breath of the "Python of the Nile," which produced then, as certainly as now, the "pestilence that walked in darkness," whether through the palaces of kings,

among the tabernacles of Israel, or elsewhere in the midst of the surrounding nations. As far, then, as positive history, and fair inferences from the nature of things may be confided in, it more than trebles, in antiquity, the date of variolous matter, and all other febrile poisons. It has been employed, therefore, a much greater length of time in the work of havock. Compared to it all other miasms are of recent origin.

Nor does it surpass them less in the extent and constancy of its ravages, than in their duration. Does the virus of small-pox, measles, and other febrile complaints, appear occasionally, and spread disease, for a few weeks or months, over certain limited districts of country? That of bilious fever produces sickness, in some form, during a part of every year, in every country inhabited by man, and, over an extensive portion of the earth throughout the whole year. Wherever and whenever vegetable substances perish and decay, in the usual manner, there and then it springs into existence, and begins its

mischief. It produced, in ancient times, the pestilential and other summer and autumnal complaints, not only of Egypt, but also of Asia-minor, Greece, and Italy, as well as of Carthage, Syracuse, Iberia, and other places, of which history informs us. And there is reason to believe that, in modern days, the sphere of its action is still wider, because the earth is more extensively peopled. It certainly presents itself to us on a broader scale. In the old world, from the northern limits of Siberia to the Cape of Good Hope, and from the Pillars of Hercules to the Eastern ocean, we are acquainted with no inhabited spot that has not suffered from it. And, on the American continent, its devastations reach from the extreme north to the heights of Cape Horne, and from the shores of the Atlantic to those of the Pacific. Nor is there, in any ocean, a peopled island, however healthy, that does not feel occasionally its deleterious influence. Such is the earthly ubiquity of this malaria.

But it has been also represented as a poi-

son of greater power than the matter of small-pox, or any other febrile miasm. For evidence in proof of this, I may confidently refer to the history and character of plague and yellow fever, as well as to those of the cholera of the east. That these are the most gigantic diseases to which man is subject; and that, in their highest grade, they extinguish life most certainly, and in the shortest period, cannot be denied. In point of strength, small-pox is doubtless a very formidable complaint. When it attains its highest degree, and assumes its most malignant character, it is exceedingly intractable, and often terminates fatally in a short period. Of measles, influenza, typhus fever, and scarlatina, the same is true. Their malignity and ravages are sometimes appalling. But no experienced physician will contend, that they are equal, in these respects, to plague and yellow fever. The consternation and flight, with the suspension of business, which the latter occasion wherever they appear, and the Lazarettos erected to prevent them from spreading,

prove satisfactorily that mankind at least concur with me in opinion. An invading army, irritated by battle, and flushed by victory, is scarcely more terrific to a crowded city than one of these calamities. Another consideration which adds not a little to the formidable character and destructive influence of bilious malaria, is, that when it has once taken possession of the atmosphere, no human means have been yet discovered, competent either to extinguish it, or put limits to its range. Experience testifies that it sets at defiance all efforts to that effect, and ceases from its ravages only with a change of season. It yields obedience to the laws of nature, but refuses to acknowledge the supremacy of man. As relates to the poison of small-pox, except when the disease is epidemic, which is but seldom the case, the reverse is true. It so far submits to human control, that it can, by judicious measures strictly executed, be circumscribed within given limits, and prevented from propagating disease through the community. To the truth of this also experience testifies.

But the forms of disease justly attributable to the miasm I am considering, are not more violent and destructive, than they are numerous and diversified. Besides plague, yellow fever, and the cholera of India, which have been already mentioned, the following belong to the formidable catalogue. The bilious fever of every country and climate, in all its modifications, including, in particular, intermittents and remittents, the same complaint under a more continued type, but not amounting to yellow fever, and bilious opthalmia, endemic in Egypt and some parts of Europe, and not uncommon in our own country. Dengue would also appear to be nothing but a modification of bilious fever. To these add dysentery, bilious diarrhœa, the common cholera of adults. cholera infantum, rheumatism, bilious colic, and hepatitis acute and sub-acute, with enlargement and induration of the liver and spleen, jaundice, dropsy, neuralgia in all its forms, the pellagra of Lombardy, elephantiasis, and several other chronic affections incidental to the inhabitants

of hot climates. Of these, some are said to be but sequelæ, or secondary complaints, arising from neglected or mismanaged bilious affections, and therefore not fairly attributable to the malaria in question. The reply to this is plain and conclusive. But for the influence of this miasm, neither could bilious fever exist, to suffer mismanagement, nor the sequelæ arise from it on that condition. The primary and secondary complaints, therefore, are equally its offspring, the former immediately, the latter remotely. Like parent and child they descend from a common ancestor, whose being alone gave being to them. These chronic affections, entailing on the subjects of them all the miseries of chachectic habits and ruined constitutions, last for years. By their means, therefore, some of the terrible effects of bilious miasm are rendered every where perpetual. Although, in temperate climates, it has itself an actual existence but for a few months every year, it lives perennially in its offspring and their product, and is to human comfort the worm that never dies.

It is the source of a much greater amount of chronic disease, with its dismal register of consuming anguish, and the withering wretchedness of "hope deferred," than all other febrile poisons.

To make up the aggregate of mischief and suffering, there are not wanting other elements of peculiar moment. By a transfer of its morbid action from the chylopoetic organs, which are its principal seat, to the brain, marsh miasm is not unfrequently the cause of madness, especially the *melancholy* form of it. Thus is life rendered a cup of unmixed bitterness, and the wretchedness of the victim is complete.

But all the evils this poison inflicts on man are not yet recited. It produces, in time, a deep and humiliating degeneracy of the race. In our own country this result is already visible; but those who would witness it, in its highest degree, must visit some of the marshy and sickly districts of Europe, more especially of France, Holland, Italy, Spain, and Portugal. In those places, where, by the

operation of the poison, through a long and unbroken line of generations, its effect has reached its maximum, the issue is deplorable. Besides being deteriorated in complexion, figure, and general aspect, the inhabitants are lamentably curtailed, not alone in corporeal dimensions and strength, but in the duration of life, and the powers of the mind. There is a foundation in nature for the belief, that those who are born and reared amidst dense and noisome fogs, and deleterious exhalations, have saturnine imaginations and clouded intellects. Hence there was much more of truth than is generally imagined, in the opinion held by the Athenians, which attributed Bœotian dulness to Bœotian mists. In some of the fenny tracts of country, just referred to, vigorous health is scarcely known. During summer and autumn disease is acute, and chronic throughout the remainder of the year. Hence enlarged and indurated spleens and livers, preternatural and unsightly abdominal distention, dropsied limbs, pale and often bloated countenances, unelastic move-

ments, a listless look, and a drawling mode of expression every where present themselves. These marks of wretchedness and degeneracy in man, united to the heavy incumbency of morning and evening fogs, streams creeping slowly along their muddy bottoms, and the general monotony of a flat country, are sufficient to make "genius sicken and fancy die," even in a traveller passing through the place. What then, must be their effect on those, who are born and reared amidst their baleful influence; whose susceptible infancy is moulded by them from the cradle; and whose blood is never vivified by a better atmosphere, their vision cheered by a fairer sky, nor their torpor broken by brighter prospects?—whose sun, in winter, shines dimly on them, through a haze, and generates, in summer, exhalations to poison them? In these abodes of misery, the decrepitude of age begins to be seriously felt before the fiftieth year of life; and real longevity is never attained. Idiotism prevails here, much more than in healthier regions. Nor, when man

suffers so fearfully, do his domestic animals escape. In size, form, action, and all the higher qualities of the races, their degeneracy is also striking. Their chylopoetic organs generally, especially their livers, are usually unsound. This bespeaks in them chronic disease; and they are often swept off in great numbers by acute epidemics. Lancisi and other distinguished writers concur with observation in testifying to this.

Of the numerous evils, *physical* and *moral*, inflicted on the human family, by the malaria I am considering, the foregoing make a part. But, of the latter class, many grievous ones remain to be told. Such are the distresses of relatives and friends on account of the sufferings of the sick, their fatigues in attending them, their deep solicitude for the issue of their complaints, the sorrows of the living for the loss of the dead, and the heavy privations which communities and nations often sustain, in the death of individuals distinguished for their talents and public benefactions. Add to this account, the disasters

produced in commercial cities by visitations from plague and yellow fever, and its amount will be appalling. This latter calamity can be appreciated only by those who have witnessed it. The spectacle it presents is often in the highest degree tragical and afflicting. The tumultuous flight of the inhabitants, without either friends or homes to receive them, and the destruction of property which this produces, the anguish of those who have not the means to fly, while the seeds of pestilence and death are around them, the interruption of trade and business, with the bankruptcy, ruin, and want, that inevitably follow, the pernicious effects of this on commercial transactions in other places, and the general gloom and despondency that prevail, constitute but an outline of it. It must be left to the memory of those who have beheld it, and to the imagination of those who have not, to fill up the picture.

Such is the minister of mischief, which the "Medical and Surgical Faculty of Maryland" would deprive of his power. The en-

terprise is creditable to those who conceived it. It is to disarm, in modern times, and in another quarter of the globe, the Python of his poison; a work which the ancients assigned to a god. Be its issue what it may, the spirit of patriotism, in which it originated, must enhance the standing of the medical profession. It shows the members of it to be in the highest degree disinterested; capable of labouring with zeal for the accomplishment of that, in which they not only have no interest beyond that of others, but of that which is manifestly hostile to their interest. All of them subsist in part, and many of them almost entirely on the ravages of malaria. Extinguish that poison, or teach the mode of obviating its effects, and half of the physicians of the world must abandon their profession. The enterprise, then, I repeat, is eminently creditable to its public spirited authors. Should it succeed, the gain to science and philanthropy will be immense. The amelioration of the process of education, I say, and its happy influence in the culture of

the mind excepted, no projected improvement of the day can compare with it. What are the excavation of canals and tunnels, the construction of rail-roads, locomotive engines, and steam-boats, and the opening of coal-mines and quarries, to the preservation of the lives of innumerable millions from the destructive influence of marsh effluvia?—What, to the protection and redemption of whole districts of country from desolation, actual or impending, by that formidable poison? Weighty and numerous as are the interests concerned in both schemes of improvement, it will not be denied that those of the latter infinitely preponderate. In one case the end aimed at is convenience and wealth; in the other, existence with all that belongs to it. Between objects so different in their import there can be no rivalry. It would be superfluous, therefore, to consume time in tracing the contrast.

But what is the prospect of success to the scheme projected by the Faculty of Maryland? This is a question of great moment;

and the experiment alone can satisfactorily answer it. *Practically* speaking, the project is new. It has been indeed thought of, and talked of, but never tried. Nor is that the worst. The task imposed by it is as difficult to be accomplished, as the views that suggested it were liberal and praiseworthy. But this constitutes no just ground of discouragement; much less of despair. Projects are not to be deemed impracticable, and to be therefore abandoned, merely because they are difficult. Man knows not the extent of his powers until he has fairly tried them. And, for the attainment of important ends, he should try them boldly. In an especial manner, nothing but the experiment skilfully made and duly persevered in, can determine the issue of the efforts of numbers, acting in concert or uninterrupted succession. Under the most discouraging circumstances it has been frequently astonishing. History and observation testify, that much more good has resulted from enterprises deemed, at the time, even rash and perilous, than ever has

from cautious forbearance. Under prospects thus disheartening was the New world discovered, and its independence from European thraldom achieved. The human mind should despair of nothing calculated for the promotion of human happiness. This sentiment which, serving as a ground and principle of action, so often saved the Commonwealth of Rome, has been an abundant source of improvement in science. The more arduous the task to be performed, the higher the zeal and the firmer the resolution with which it should be encountered; and the brighter the glory of him who may accomplish it.

In the present enterprise, the adventurers, I doubt not, will be numerous and distinguished. An invitation so honorable from a source so respectable, and designed to subserve an end so important, cannot fail to be eagerly accepted by the votaries of medicine and the friends of our race. Although the object contemplated, therefore, may not be attained to the entire satisfaction of those who

proposed it, something will doubtless be done in promotion of it. By the offering of each labourer, however limited, to the common stock, an aggregate will be formed, that must facilitate the task to future adventurers. *E pluribus unum* is a motto as important in defence of truth, as of States. Nothing can resist the human powers, when they act in well trained masses, successively and steadily. They form a perpetual phalanx, to which, in time, every thing must yield. As relates to the object of this discussion, therefore, should one set of adventurers fail, another set, co-operating under more propitious circumstances, will prove successful. And, in this case, a portion of the glory will belong to the first. They had commenced the breach, which their successors completed, and passed it in triumph. It is under the influence of these sentiments, and from a wish to contribute my quota, however small, toward the completion of the great work, that I respectfully submit to the faculty of Maryland the present Dissertation. That it will contain

any thing new or instructive to *them*, I ought not perhaps to flatter myself. Nor do I know that it will be a repository of such matter to any of my fellow citizens. Its entire contents may have been, for ought I know, already anticipated by other inquirers. All I promise or pretend to is, faithfully to embody in it such facts and thoughts, bearing on the subject, as I now possess, or as may occur to me while engaged in composing it. I trust, however, it will be permitted me to add, without incurring the charge of vanity or presumption, that the matter it shall contain, whether useful or otherwise, is the fruit of many years' observation and research, matured by a corresponding degree of reflection. I have visited and examined many sickly spots, in other countries as well as my own, with a mind awake to the condition of the inhabitants, and an earnest wish to see it amended. The subject is not therefore new to me.

But I entreat the Faculty not to misunderstand me. It is not my intention to trou-

ble them with a Dissertation ponderous in learning and encumbered with authorities. Such a production would be alike unworthy of them and the subject. They are not now to be informed, any more than myself, that the terms *learned* and *useful* are neither synonomous, nor always convertible into each other. They are unfortunately very often directly the reverse. Nor are there many subjects, in connexion with which this would be more likely to be the case, than that which I am now considering. Learning, as respects it, would be little else than another name for a useless citation of vague conjectures and antiquated hypotheses. Much indeed has been said and written *about* the malaria of bilious fever, but, as far as I am informed, very little directly *on* it. In the course of my reading, it has fallen in my way to look into the works of almost every writer of note, who has treated of it since the days of Lancisi, its great discoverer; and I regret to say, that the labour has far overbalanced the reward. True, I have enjoyed what the world

calls the pleasures of variety; for no two authors I have ever examined have thought and written alike about it. Each had his own dream, and his own method of relating and interpreting it. In one I encountered a battery of unrelenting dogmatism; in another a methodical array of what he called "facts," but which appeared to me to be nothing but *fancies;* and in a third, I was compelled to thread the brake of what admiring readers denominate *ingenuity;* a term which occupies the entire space from profound and resolute sophistry, to the frothy surface of dextrous trifling. But, as respected sound and useful information, all was to no purpose. I rose from my task precisely as I had sitten down to it; with the exception, at times, of disappointed feelings and an aching head. Seriously; as far as my inquiries have extended, the crude views, and indefinite expressions of writers on malaria, are incompatible with accurate information and practical results. I allude chiefly though not wholly to speculations about the *nature* and *modus*

operandi of the poison. Occasionally useful facts are presented to us scatteringly, like oases in the desert. But from being insulated they are almost lost. They want the force of system and concert. They resemble a disjointed assemblage of militia-men, whose power during action, being exerted individually, is wasted without effect; while well trained regulars act in masses, and achieve victory. Even professed writers on Hygiene and medical police are exceedingly defective in their remarks on malaria. Much more is this the case with common writers on the diseases of the East and West Indies, and other warm climates, and marshy countries, most of whom are mere practitioners, rather than philosophers, and whose object is cure rather than prevention. Indeed, as relates to the true philosophy of malaria, I do not know that any additional light, worthy of notice, has been thrown on it, since the time of Lancisi. That illustrious physician discovered and proved the existence of the poison, and pointed out some of its laws;

and I am unacquainted with any subsequent writer who has done more. The abundant succession of hypotheses we have had, has obscured and retarded truth, rather than brightened or advanced it.

But I must have done with these digressions and prefatory remarks, and hasten to my subject, lest others should say of me, as I have done of my predecessors, that I write "about it," rather than "on it." I am indeed aware that the freedom of comment I have indulged on the productions of others, invites the same in relation to my own. And my wish is to that effect. Free discussion is essential to truth; and that is the object at which I aim. It shall be my endeavour, therefore, as it is my wish, to proceed on the ground of fact and fair induction. With hypothesis I have no concern. I shall erect none myself, nor consume much time in subverting those erected by others. Such toys of the fancy are suited only to the slumbers of the cloister. It is my desire to have my sentiments scrutinized with strictness and candour. If they

pass an ordeal thus conducted, they will be worth possessing. If not, the sooner their mistakes are detected and refuted, the better. The issue will instruct myself as well as others, and so far free me from the thraldom of error. And that is the freedom to which I aspire. Under all the circumstances of the case, I have nothing to ask or expect but justice; and that, as relates to the present discussion, I doubt not I shall receive. I shall therefore proceed in it without further deviation.

SUBJECT DISCUSSED.

The entire subject of this Dissertation, as proposed by the Faculty of Maryland, is included under the four following questions.

1. What is the *nature* of the malaria that produces bilious fever?

2. From what source or sources does it arise?

3. What are the best means of preventing its formation, and removing its sources? and, when the sources cannot be removed, nor the formation prevented,

4. How may its effects on the human system be most certainly obviated?

These questions I shall now consider, in the order in which they are here proposed, treating each of them as succinctly as the subject will admit.

1. *What is the* NATURE *of the malaria that produces bilious fever?*

To this question my answer is brief. ***I do not know.*** Nor is any one better informed about it than myself. The present state of science does not admit of better information. By no other test than its deleterious effects on the animal kingdom, more especially on man, can even the existence of the poison be established. Of its nature or composition, or the species of matter to which it belongs, no more is known than is of the poisons of small-pox, measles, or rabies canina. Here the matter, for the present, might be suffered to rest, were it not that multiplied errors respecting it are afloat, the exposure of some of which would seem, in its beneficial effects, to be second only to the discovery of truth.

The malaria of bilious fever is supposed, no doubt correctly, to be the product of chemical agency. The votaries of the laboratory, therefore, have endeavoured to make it the subject of chemical experiment. But in no instance have they succeeded. Virtually they have sought a phantom and found nothing. Their efforts have been as unavailing as those of a child that pursues its shadow, or grasps at a moon-beam. I speak from personal observation. I have often witnessed these attempted experiments, and sometimes engaged in them myself, with equal interest and disappointment. They were tried on the atmospheres of different places, where bilious diseases prevailed in every grade, from a slight intermittent, to malignant yellow fever. But they were tried to no purpose. In the air where man contracted disease soonest, most certainly, and of the worse character, no more poison of any kind was discoverable, than in the healthiest atmosphere of the hill-top or the mountain. Nor could any extraneous matter, in the form of

gas or otherwise, be detected in the one body of air more than in the other. In each all the common atmospherical components were present in their natural proportions; and nothing else appeared. Neither a deficiency of oxygen, therefore, nor a superabundance of carbonic acid gas, or of any other known chemical compound, could be indicated as the cause of the prevailing sickness. That evil was the product, as already mentioned, of a lurking agent, whose very existence could be recognized only by the injury it inflicted on animated nature.

But, as relates to the nature of bilious malaria, the influence of chemistry has not been merely negative. It has not only failed to confer any benefit on the medical profession; it has proved to it a source of positive mischief. This it has done by becoming a hot-bed of hypotheses, to the exclusion of observation and sober inquiry. During the late domination of ultra-chemistry, when the entire system of man was considered a chemical laboratory, and almost every sci-

ence was adulterated by the caloric of the crucible or the fumes of the retort, it was impossible that malaria should not be considered a product of the same source. And as some chemists affected a knowledge not only of all the elements, but also of all the combinations of matter, it was inevitable that they should attempt to identify the poison in question with one or other of the gases formed by their experiments. From this arose a state of things which seemed to proclaim, that the only province of *chemical* physicians was to deal in *conjecture*. And their art was practised indiscriminately on the phenomena of living and dead matter. Hence, as respected malaria, the brain of every member of that school brought forth its own peculiar fancy, until, collectively, the motly brood almost equalled in number, and quite in ludicrousness, the fables of Æsop. Every single gas, with every imaginable mixture of gases, was proclaimed in its turn, or rather in a simultaneous and promiscuous uproar (no candidate for the honor of discovery waiting for

or listening to a competitor) to be the miasm productive of bilious fever. But, as far as I remember (for I was not so much edified or delighted by the tumult, as to treasure up all that transpired in the course of it) public attention was longest and most forcibly attracted by the claims of the nitrous oxid, or some other nitrous compound, and carbonic acid gas. These found many advocates, some of them distinguished for ability and eloquence, who made it, for several years, their daily study and nightly toil, to prove them the source of bilious complaints. Yellow fever was, at the time, prevailing annually in our large commercial cities. An effort was made, characterized by much ingenuity, and urged with a degree of industry and perseverance worthy of a better cause, to derive that malady from nitrous oxid, or some other gas, whose base was nitrogen. The New York Medical Repository contains many papers in defence of this hypothesis, some of which are marked with much research, and an unusual share of strength and dexterity in

argument. But they were written to no purpose. Nature has decided that fact must prevail; and that all else is perishable and evanescent. However attractive and imposing the form and colouring that talent and labour may bestow, for a time, on hypothesis and error, they cannot establish them on the ruins of truth. The nitrous-oxid notion, therefore, had its day. But it was short. Records only say of it, that it *was*. Present opinion says it is *no more*. Two well known facts ought to have been sufficient to stifle it in its birth. No mode of applying nitrous oxid, or any other nitrous compound, to the human body, can produce yellow fever. The experiment was repeatedly made, during the period referred to, and uniformly failed. Nor could a particle of the gas in question be detected in the atmosphere of the places where its supposed product prevailed. Other objections might be added; but they would be superfluous.

Although still more palpably erroneous, not to say absurd. the hypothesis attributing

bilious fever to carbonic acid gas has yet some advocates. But they are not numerous. Why they ever had an existence among physicians possessing any knowledge of that gas, is to me unaccountable. Its presence in the atmosphere is easily detected. But experiment proves that it does not exist in unusual quantities, in places where bilious diseases prevail. Much less does it exist in quantities proportioned to the amount of disease. If the report of a distinguished physician may be credited, the reverse is sometimes true. It is found in a comparatively diminished quantity in places of sickness. Fort Fuentis stands in a marshy and sickly district, at the mouth of the Vateline. Mount Legnone, one of the chain of the Grison mountains, which rises 8640 feet, French measure, above the level of the sea, is peculiarly healthy where it is inhabited, and its summit is covered with perpetual snow. In these places, when fever was raging in the low country, Gattoni made repeated experiments, and found, to his surprise, that, chemi-

cally speaking, the sickly atmosphere was the purest of the two. In other words, it contained the greatest amount of oxygen, and, of course, a diminished proportion of its other elements. The positive quantity of carbonic acid gas in each place was the same. For the accuracy of these experiments I am unwilling to vouch. I have already mentioned, that those of a similar nature, in which I have been myself concerned, gave a different result. They indicated no difference between a healthy and a sickly atmosphere. The result of a series of experiments by Moschati was the same.

But this is not all. Every one knows that, in whatever way it may be applied, the effects produced on the human system, by carbonic acid gas, are totally different from those that result from bilious malaria. No two classes of phenomena can be more dissimilar. Measles and influenza, scarlatina and smallpox, are much more alike. Were the hypothesis I am opposing true, the attendants on lime-kilns. where immense quantities of

carbonic acid gas are hourly evolved, would never be free from bilious fever. Nor would the complaint fail to attack us by our firesides, especially in winter, when we consume oil in our lamps, and spermaceti in our lustres. Every Laplander's hut, moreover, during his long night of winter, would be a fruitful source of febrile malaria. Yet throughout that period, in particular, he is a stranger to the complaint which that poison produces. Even the chemist in his laboratory, when preparing carbonic acid gas, would frequently suffer from his own experiments. In a more especial manner, were the notion true, what would become of our lovers of porter, ale, cider, champaigne, and soda-water, who are swallowing, by the hour, deep potations of the reputed miasm? In that case, every butt of beer would be fraught with the seeds of bilious fever, and every brewery and soda-water fountain, as rich in poison as the Pontine marshes. The hypothesis is ludicrous; and were it not that it has received the sanction of physicians of standing, would

be unworthy of a moment's serious consideration.

Another chemical notion respecting the cause of bilious fever, deserves perhaps a passing notice. It is that which attributes the disease to the hypercarbonation of the blood. This again, I say, is as empty a conjecture as has ever issued from the dreams of a visionary. The blood of patients in bilious fever, say its advocates, is always preternaturally dark coloured, from holding in mixture a superabundance of carbon. Neither this position itself, nor the attempted explanation of it, is true. As a *general rule*, the blood of patients in bilious fever is not preternaturally dark. It assumes that colour only under particular circumstances, which have no connexion with the amount of carbon in it. They are explicable only on a very different ground; and on that their explanation is easy. I venture to say, moreover, that the venous blood, in bilious fever, is more frequently preternaturally florid, than preternaturally dark. During the stage of excitement, if the reaction

be strong and the circulation free, its colour is always too high. Nor am I the first writer who has said so. The fact is recorded by Riverius, Cleghorn, and Huxham, and, if I mistake not, also by Sydenham and Rush; and I am confident it must have been witnessed by thousands of others. I doubt whether there is a practised bleeder in the United States, to whom it is not familiar. During the access and cold stage of intermitting fever, the blood is always dark, and becomes florid again, in the stage of excitement. It is also dark in deeply congestive bilious fever, where reaction is suppressed; but in open fever, of high excitement, the reverse is true. In fact, in every case, where the circulatory system is torpid, or in any way wanting in action, and respiration deficient, the blood is, and, by the laws of the animal economy, must be, preternaturally dark. But it never is nor can be so, when circulation and respiration are vigorous and free. Were it admissible for me to dwell on it, all this is perfectly explicable, on principles which no physiologist

would controvert. Nor has carbon any more connexion with the phenomenon, than it has in giving fragrance to the rose, or lustre to the sun. That it should, by intelligent physicians, be supposed to have, is matter of surprise.

Have chemists detected, by a *fair and satisfactory analysis*, a superabundance of carbon in dark venous blood? Have they detected in it a particle more than is found in the florid blood of the arteries? The annals of their profession cannot reply to these questions in the affirmative. Or if they can, I know not where the record is to be found. Conjecture indeed has said yes; but fact has not concurred with it. Again; does a mixture of carbon with bright arterial, convert it into dark venous blood? No physician of reputation will contend that it does. I, on the contrary, assert that it does not. I have witnessed the experiment, and know that I speak correctly. The hypothesis is an abuse of animal chemistry, which should receive no countenance from real physiologists.

Were I to say the same in general of chemistry, as applicable to the functions of living matter, I might set opposition at defiance. It neither performs any of them, nor aids in the performance. Within its proper sphere, that science is delightful and important. None can be more so. But it is concerned exclusively with dead matter. With life and all its attributes it is at war. It is the great antagonist of life, and life of it. It is no more suited to explain a single function of living matter, than the laws of life are to explain the formation of carbonate of magnesia, or Glauber's salts. When an attempt is made to expound by it a vital phenomenon, it is dislocated and misapplied; and that dislocation, like every other, proves a source of mischief. The harmony of nature consists in every thing producing after its kind. Abrogate this law, and chaos is recalled. Chemical causes, therefore, can produce only chemical effects, and vital causes vital effects. They are not transmutable in themselves or their action. Physiologists would escape an

infinity of trouble, and the profession no less confusion and error, were chemists to confine themselves to their proper laboratories, and to dead matter. The living body of man is as completely without their sphere, as its structure and economy are beyond the imitation of the manufacturer of chess-playing automatons, and rope-dancing harlequins.*

* It is in vain for M. Broussais, and other animal chemists, to endeavour to explain away the error they propagate and the mischief they do, by the terms they employ. To tell us that, by "animal and vegetable chemistry," they mean the mutual action, in the form of decomposition and recomposition, of the "radical molecules of organized matter, *under the control of the vital principle*," is of no avail as to the object they profess to have in view. Chemistry is a technical word, possessed of a definite meaning. For centuries it has been the representative of certain changes in the composition and qualities of matter, produced by affinity and repulsion, under the influence of given laws. Nor is there between those changes and the phenomena of life the slightest similarity. They are, on the contrary, the antipodes of each other. Dissimilitudes stronger than those which exist between them can scarcely be imagined.

Yet when the changes in living matter are said to be produced by "animal chemistry," nine persons out of ten, I might say ninety-nine out of a hundred, attribute them to

There are not wanting chemical physicians who would identify yet other gases with the malaria productive of bilious fever. Of these substances some are sulphurated hydrogen gas, phosphorated hydrogen, and I believe carbonated hydrogen, with perhaps a few others. As relates to all of them, a single remark is sufficient to subvert the hypothesis which embraces them. Not one of them can be detected in the atmospheres of places where bilious fever prevails. Agitate, with a stick, the bottom of a pond, where masses of vegetable relics exist in a dissolving state,

the agency of the *common* chemical affinities; I mean the chemichal affinities of the laboratory. They consider respiration, digestion, and other vital functions as belonging to the same class of processes with the combustion of charcoal, the decomposition of water, and the formation of neutral salts.

Thus is error propagated by an *improper use of words*. Nor does there exist for that use the slightest necessity. The expressions, *animal action*, *vegetable action*, or the more general one, *vital action*, would be much better than *animal*, *vegetable*, or *vital chemistry*. The former, although not explanatory of any thing, do not mislead; whereas the latter do. I need scarcely add, that every phrase which propagates error ought to be erased from the language of science.

and some of them will indeed rise to the surface of the water, and may be ignited. But examine the atmosphere only a few feet distant, and no trace of them will be found in it. To this may be added, as another objection, that no application of these gases to the human body can produce any form of bilious disease.

Another hypothesis respecting the malaria in question, which has found advocates of some respectability is, that no such poison exists; but that bilious fever results exclusively from heat, moisture, and vicissitudes in temperature. My reply to this notion shall be brief, but I trust satisfactory.

When yellow fever prevails in a city, it is often arrested, in its progress, by the interposition of a street not more than sixty feet wide. It advances to the east or the north line of the street, but goes no further. Almost all the inhabitants on that side suffer; and all those on the opposite one escape. Such a case I have repeatedly witnessed, and therefore speak confidently of it. Many others have

witnessed it also. Of oriental plague the same is true.

How is this phenomenon to be expounded? Place on each side of the street a thermometer, a barometer, a hygrometer, and a pluviometer, and they will show the atmosphere to be, in both places, precisely alike in temperature, weight, and moisture, as well as in the changes it undergoes, and the rain it precipitates. To no difference, in these respects. then, can the difference in healthfulness be ascribed. But one source of solution remains. The disease arises from a subtle poison, which reaches the street, but does not cross it. A stream of water of moderate width has arrested the progress of sickness on the same principle.

Again. Yellow or common bilious fever is raging along the bank of a large river, or some other body of navigable water, and a ship is lying in it, at cable's length from the land. Provided the vessel be kept clean, and her government be judicious, the crew will continue healthy, unless they are permitted

to visit the shore; in which case they will suffer from the prevailing disease. This is a common occurrence, which no difference in the sensible qualities of the atmosphere can explain. No difference indeed exists in them. At the edge of the water, and seven hundred feet distant from it, where the ship lies, those qualities are the same. But there is a miasm at the former place, which does not reach the latter; and hence the difference, as relates to disease.

Some of those who deny the existence of malaria, attribute bilious fever to the deleterious influence of atmospherical moisture alone. Were this hypothesis true, no maritime situation could ever be healthy. The atmosphere of such places being necessarily surcharged with humidity, bilious fever would be an annual scourge to them. It would be rather perennial, prevailing during the winter as well as the summer, the atmosphere being humid throughout the year. But if free from swamps and marshy ground, maritime situations are peculiarly healthy. Of insu-

lar places, especially small ones, the same may be said. The marine air sweeping entirely across them, their atmosphere is saturated with moisture, and often darkened by fogs; and yet they are among the healthiest spots on earth. Bermuda, the Bahamas, and particularly most of the Scottish isles are of this description. The atmosphere of a vessel at sea is necessarily very humid. Yet, provided she be clean and well governed, she is always healthy. To neither humidity, then, nor any other sensible quality of the atmosphere, can bilious fever be reasonably ascribed. It is the product of an aerial poison, significantly enough denominated malaria, whose effects alone on the animal kingdom proclaim its existence.

2. *From what source or sources does bilious malaria arise?*

From vegetable and animal matter, more especially the former, in a state of dissolution. I say "dissolution," not putrefaction; because there is good reason to doubt whether that process, in the technical meaning of

the term, be necessary to the result. Bilious fever, in all its varieties of type and degree, often prevails in places where no putrefaction is discoverable. But dissolution, by which I mean the decomposition of dead organic substances, and the reunion of their elements, producing new compounds, is present. In no other way can the malaria be formed. At least it never manifests itself, except in situations where traces of the process referred to appear. That my remarks may be the better understood, when I shall speak hereafter of the prevention of this miasm, I must treat of its production somewhat circumstantially.

The medical world is in the habit of referring to Lancisi, as the discoverer of the malaria of bilious fever. In a certain view of the subject, I have already admitted that the reference is correct. He was so far the discoverer of it as to be the first to pronounce it the *azotic* or lifeless result of the chemical dissolution of vegetable and animal substances, and to bestow on it a name expressive of what he considered its nature. Others, who

had spoken of it, believed it to be, as will appear presently, not *dead* matter, but a countless brood of animalculæ, infinitely small. He called it *paludum effluvium*—marsh exhalation—because he believed a marsh, lake, or some other form of stagnant water necessary to its production. But he was far from being the first to indicate fens and marshes as sending forth, directly or indirectly, vapours and other kinds of matter productive of bilious and pestilential diseases. In expressing their conviction of the pestiferous influence of such places, the ancients were as clear and decided as he was. But they spoke in poetry, he in prose; they in the language of fiction, he in that of philosophy. Each treated the subject in the spirit of the age in which he lived. Had he been an ancient Greek or Roman, he would have derived the poison from the breath of the Python, or the Hydra (two words which, united, signify *putrid water*) and had Celsus or Galen lived at the beginning of the eighteenth century, either of them would have

pronounced it the result of the disssolution of organic matter. So true is it that men often attain to high renown, for promulgating opinions and doctrines, believed to be entirely their own, but which, in fact, belong, in a great measure, to the periods in which they live. Their predecessors had sown the seed, and they appeared at the proper seasons to reap the harvest. Had they not been born to do it, others more fortunate would. This is true of every discoverer, however illustrious. Had neither Columbus, Newton, nor Franklin seen the light, others would have appeared about the same times they did, to discover a New world, unfold the laws of material creation, and prove the identity of electricity and lightning.

Centuries before the time of Lancisi, true poetic fiction, respecting the cause of the pestiferous influence of marshes, had given place to what might be called philosophical hypothesis; I mean certain views or notions, which their authors believed to be true, but of which they had no substantial evidence.

They were the grave but visionary conjectures of the cloisters, sanctioned by the solemn dogmas of the schools. They marked the transition state of the human intellect from real fiction to real philosophy. Many writers, before the age of Lancisi, declared the cause of bilious fever to be the offspring of putrefaction. But, as already observed, they deemed it animalcular. They were believers in equivocal or elementary generation. In their opinion, therefore, putrefaction in marshes produced myriads of animalculæ, too minute to be detected by our senses, or to become cognizable in any way, except by their effects on larger forms of living matter. These monads of life, as small and as numerous as particles of air, made their way into the human body, by the pores of the skin, or in some other manner, mingled with the fluids, pierced and poisoned the solids, and spread corruption through the whole. Then, propagating their like, with wonderful fecundity, they issued from the bodies of the sick, to invade those of the well, and thus the dis-

ease was rendered contagious. This hypothesis of animalcular contagion, however wild and irrational it may be deemed, has its advocates even now. Lancisi had only to exchange the generation of poisons animalculæ by putrefaction, for the generation of a poisonous gas, and his work was done. Nor does the exchange seem difficult. On the contrary, it was easy and natural, because all things were prepared for it. If he had not made it, therefore, some body else would have done it in his place.

Let it not be imagined that I mean, by these remarks, to detract from the just reputation of the illustrious Italian. Far from it. No one does homage more sincerely than I do, to his talents and services. He was one of the great promoters of medical science of his day. But, had he lived at an earlier and darker period, he would have been less fortunate, because all things would not have been matured for the discovery. He would not, therefore, have been the author of it; but it would have been reserved for another.

Hence, in what I have said respecting him, I only mean to give a correct representation of the progress of the human mind, in the attainment of knowledge. This concerns the history of general science, as well as of discovery, and should be known to every student of nature.

Lancisi, then, finding opinion in the state just represented, advanced it another step, by pronouncing the poison, which had almost desolated the country around Rome, the issue of putrefaction, in the form of gas, instead of animalculæ. Nor did he issue his belief in the shape of mere conjecture. He sustained it by an array of facts and arguments, which all his enemies and competitors for fame were unable to shake. He was as fortunate in proving that bilious fever is the product of a poison, resulting from the dissolution of dead organic matter, as Harvey was in proving the circulation of the blood. And he had certainly a more intricate subject to handle. As relates to the mere establishment of the fact, nothing material has

been since added; nor do I know that any thing such remains to be added, to what is contained in his admirable work "*De noxiis paludum effluviis.*" The substance of all that has been said, in support of the doctrine, by subsequent writers, is there condensed, in a style and manner, that bespeak alike the strength and independence of the writer, the accomplishment of the scholar, and the resources of the philosopher.

But was Lancisi correct, in the name he affixed to the malaria he discovered? Is it really *paludum effluvium?* Is a marsh or fen necessary to its production? No; it is not; and much evil has arisen from the mistake of looking to such places alone for its formation. Thousands of individuals have fallen victims to the error. The Italian discoverer convinced himself that it issued in abundance from the Pontine marshes, and the Campagna di Roma, with its numerous ponds, and thence inferred, that such collections of stagnant water were essential to its generation. But he was mistaken. The

most terrific calamities it has ever produced, have occurred where there were neither fens nor marshes. Witness yellow fever in the cities of the United States, of the West India islands, of tropical America, and the south of Europe, and true pestilence in those of Asia and Africa. That the miasm is generated along the *borders* of marshes is true; but perhaps the *bodies* of such places never produce it. Or if they do, their *water* absorbs it again, and prevents it from doing mischief. That fluid has a strong affinity for it. Hence the centre of large swamps is usually a place of health. Labourers in cyprus-swamps rarely suffer from bilious fever; the more especially when they are remote from the borders of them.

Am I asked, then, what is essential to the production of malaria? I answer, four elements, dead vegetable matter, a high temperature, atmospherical air, and water in moderation. What particular part of the process depends on atmospherical air, I know not. But there is reason to believe that some part

of it does. When speaking of the generation of the miasm, therefore, I shall always suppose the presence of air. In citing vegetable matter, as one of the elements in the production of malaria, it is not my intention to exclude entirely animal matter, especially that of animals of the lower classes. It is quite probable that that may unite with vegetable matter in the process of dissolution, and aid in the general effect. My only object is to express my belief, that the latter is greatly superior in quantity, and therefore more extensively tributary to the formation of the poison.

Whenever these elements meet in due proportion, and continue together a sufficient length of time, malaria is the issue. But if one or more of them be absent, the miasm is not formed. Is heat wanting, as in winter? No poison is generated. Is moisture wanting, as is the case during part of the summer, in the Delta of the Nile? Malaria is also wanting, and health prevails? Is perfect cleanliness preserved, by the removal of

all dead vegetable and animal matter? The production of the poison is impossible. The same is true, if water superabound, so as to flood the vegetable mass. Too much water is as fatal to the process, as perfect dryness. Hence Egypt is healthy while inundated by the Nile; and when, in consequence of inordinate rains, a marsh is entirely overflowed, it ceases, for the time, to be a source of sickness.

That malaria may be generated, it has been pronounced necessary that its elements be together "in due proportion,' and "a sufficient length of time." But facts are wanting to warrant a decision, what either the exact "proportion," or the "time" should be. Observation seems to teach us, that in the United States, the production of yellow fever requires at least a month's continuance of tropical heat. After that duration of such a temperature, unless the general constitution of the atmosphere forbid it, the danger becomes threatening. Such was certainly the case in the city of Philadelphia, during the

pestilential period, which lasted from 1793 until 1805. Records can be produced to show, that throughout that term of years, yellow fever never failed to appear, in greater or less extent, after the above mentioned continuance of tropical heat. Nor did it ever occur under a temperature of less intensity and duration.

Does any one doubt whether the agents here cited are the real elements of bilious malaria? I reply, that the evidence to that effect appears conclusive, and that the doubt is therefore groundless. As already stated, wherever the agents referred to exist, the poison manifests itself, in the production of some form of bilious disease. And where they do not exist, no such manifestations are made. The more abundant the agents are, in due proportions to each other, the more extensive, and usually the more violent is the complaint; and nothing but themselves is known to be necessary to the effect, or in any degree auxiliary to it. Add, that the disease prevails more certainly and generally in their

vicinity, than at a distance from it, and the evidence, I repeat, would seem to be conclusive. But perhaps it may be the wish of some to have a few exemplifications on the subject. If so, the following are submitted to them.

In all large and crowded cities, in the United States, and other warm climates, heat, moisture, and dead vegetable and animal substances abound in mixture with each other, and unite in their action. The consequence is known. In such places bilious complaints are an annual evil. And they are usually graduated, by the amount of the agents which the places contain. It is believed that they would be always thus graduated, did not a peculiar constitution of the atmosphere at times interfere. Of the borders of swamps, marshes, and large rivers that overflow their banks, the same is true. There, the elements of malaria are found in sufficient abundance; and there also disease prevails. Alluvion is composed, in part, of vegetable and animal relics; and in no portion

of our country is either heat or moisture wanting. In every alluvial district, therefore, in the United States, the agents necessary for the production of miasm exist. Here again the issue is the same. Such places are visited annually by bilious complaints. The condition of health, during summer and autumn, in the low grounds of all large rivers may be safely offered in proof of this. Again. Rich soil of every description, whether it be alluvial or not, contains, of necessity, a considerable portion of animal and vegetable remains. On these alone its fertility depends. Such soil, then, is copiously impregnated with one material of miasm, greatly comminuted, and in a state of high preparation to co-operate with the others. Nor is there any climate where heat and moisture are always wanting. Hence, in every region, fertile districts are visited at times by bilious complaints. To this it is believed that the chart of the world does not present a single exception. The event occurs more uniformly and distressingly, and is therefore more noticed, in warm

climates. But it occurs, more or less, in every region inhabited by man. Although the fervours of the line peculiarly favour it, the rigors of the north do not forbid it. Were I inclined to moralize, I might say, that it seems like an impartial provision of nature, to counterbalance the advantages of a fertile soil, and render all places nearly equal, as respects the enjoyments and happiness of their inhabitants.

The reverse of the picture here presented is not less favourable to the opinion I am maintaining. In the soil of sandy plains, remote from rivers, lakes, and other large bodies of water, and somewhat elevated, vegetable and animal relics have scarcely an existence. Nor are malaria and its effects the scourge of such places. Whatever may be the amount of heat and moisture they experience, the inhabitants are exempt from bilious fever. The reason is, the absence of vegetable and animal remains. In proof of this, the pine lands of the Carolinas, Georgia, and Louisiana, which are elevated plains of

sand, afford, during the summer and autumn, a healthy retreat from the diseases of the maratime and fluvial districts. Further; hilly and mountainous regions are not more remarkable, throughout the world, for their barren soil, than their salubrious atmosphere. Hence, in contrasting the poverty, health, and hardihood of the Swiss, with the luxurious ease and effeminacy of the Italian, the poet expresses himself in the following strain, whose sentiment is as correct, as its diction is nervous.

"My soul turn from them (the Italians) turn we to survey
"Where rougher climes a nobler race display,
"Where the bleak Swiss their stormy mansion tread,
"And force a churlish soil for scanty bread;
"No product here the barren hills afford,
"But man and steel, the soldier and his sword."

Of all this the reason is plain. The soil of hills and mountains contains but a small portion of vegetable and animal remains in a dissolving condition. It is wanting, therefore, in one of the elements of febrile miasm. The issue is in conformity to a law of nature. The cause being absent, so is the effect. No ma-

laria in the atmosphere, no disease among the inhabitants. . Such is the case throughout the world. Withhold from any place, heat, moisture, or vegetable and animal remains in a state of dissolution, and it will be exempt from miasm and bilious complaints. Unite them, under the circumstances already indicated, and the reverse will be the consequence. Malaria will be generated, and disease will prevail.

Am I asked whether large masses of animal matter alone, especially the matter of the higher orders of animals, such as corpses in crowded cemeteries, and the carcases of men and horses in besieged towns, and on the field of battle, ever produce bilious fever? To this question I can reply only as a reader of books, and a listener to reports; and those sources of information are self contradictory; being, in some instances, affirmative, and in others negative. From personal observation I know but little of the matter. If I am not mistaken, I have seen yellow fever produced, in a city, by putrid oysters, fish, and hides;

the last of which articles belong to a high class of animals. Whether the same result would be produced, on a field of battle, in the free and open air of the country, some may deem doubtful. Many reports, however, not unworthy of credit, are strong and positive in affirmation to that effect. Were I to hazard an opinion on the subject, it would be, that wherever found, large masses of animal matter, in high putrefaction, may generate a poison productive of fever. That such is the case, in the semi-stagnant atmospheres of cities, does not, I think, admit of a doubt. Had I leasure to dwell on the subject, it would be easy to show, that the immense exhumations of dead bodies in Dunkirk and Paris, with other analagous facts related by Dr. Bancroft, furnish no evidence subversive of this belief. But I am not persuaded that the poison is the same with that of common bilious fever. Facts seem to justify a contrary belief. The latter being chiefly of vegetable, and the former exclusively of animal origin, they can scarcely be identical. The

diseases, moreover, which they produce, differ not a little in type and character. Fevers resulting from an animal miasm are more continued in their form; those from a vegetable one less so. Other evidences of a difference between the two miasms exist. But as the point is not essential to the present inquiry, I shall not dwell on it.

Different opinions are held respecting the influence of the exhalations from slaughter-houses, and from manufactories of soap, candles, catgut, and glue, on the health of the neighbourhoods in which they stand. Most persons pronounce these effluvia deleterious; while a few have contended that they are not only innocent, but actually salutary. I am but little inclined to become the advocate of either opinion. That any exhalation from dead matter mingling with the atmosphere, is positively healthy, I do not believe. I am not sure that even the fragrance of incense or the perfume of flowers is so. On the contrary, I apprehend they are not. The freer the air is from foreign mixture, the fit-

ter it is for respiration, and the more subservient to the preservation of health. But while I admit that the exhalations under consideration do harm rather than good, I have no reason to believe that they produce yellow fever, or any other bilious affection. I have repeatedly examined the slaughter-houses, and the factories just designated, of some of our large cities, with a view to satisfy myself as to the influence of their effluvia. The odour they emit, though offensive, is not sickening. Nor is it the issue of that far-gone putrefaction, which, in the substances concerned, would seem necessary to the production of a febrile poison. Such putrefaction, would render the articles subject to it unfit for use. They are therefore worked up, before they reach it in the changes they undergo. Nor is this all. There are yet stronger reasons for doubting the pestiferous qualities of the effluvia I am considering. Those persons most subject to their action are not injured by them. Butchers, and workmen in the factories mentioned, enjoy as good

health as any of their fellow citizens. Be the cause what it may, the former are even proverbially healthy and robust. Nor is the health of the neighbourhoods immediately exposed to the exhalations, in any measure harmed by them. Throughout the year, it is no less perfect than that of other places. For these reasons, I cannot concur with those, who denounce the places referred to as sources of malaria.

The precise degree of moisture most favourable to the production of bilious miasm has been lately a theme of inquiry and discussion. And perhaps the question is not yet decided. An article on the subject was published, about ten years ago, by Dr. Ferguson, of the British military staff, in Vol. IX of the "Transactions of the Royal Society of Edinburgh," and republished, with commendations, in Vol. VII of the "Philadelphia Journal of the medical and physical sciences." In that paper, which has attracted more attention than it deserves, the author professes to teach physicians something new,

as respects the production of febrile malaria, more especially as relates to its connexion with vegetable and animal matter, and the amount of moisture requisite to the process. But, as far as fact and useful information are concerned, he *professes* only. *Actual performance*, in any part of the effort, is looked for in vain. The only thing new, contained in his article, consists in a few inferences and notions, which are manifestly erroneous. Many of his facts are indeed *individually* new, because they had not been previously reported. But, *in kind*, they are as familiar to the enlightened portion of the profession, as any others connected with medicine. They tend to show that but a small proportion of water is requisite to the formation of bilious miasm; and that therefore marshy and flat alluvial situations, which are healthy, in wet seasons, because they are flooded, are sickly, in arid ones, because they are drier. Such, I say, is the only purport of his *facts;* and it was as well known to the faculty half a century ago, as it is now. Almost every author

of reputation who has written, within that period, on the connexion between bilious fever and the character of the weather, has recorded his testimony to that effect. Nor does daily observation withhold its concurrence. Those who live near mill-ponds are perfectly aware, that, in wet seasons, when the ponds are full, the neighbourhoods around them are much healthier, than in dry ones, when their waters are low, and a line of alluvial deposit along their edges is exposed to the sun. Respecting swamps, marshes, and rivers, the same is true. When flush in water, during rainy seasons, they do no injury to the health of those who inhabit their vicinity. But when their waters are deficient, in consequence of a drought, and their alluvion uncovered, they become sources of miasm, which produces disease.

Such, I repeat, is the amount of all that Dr. Ferguson's *facts* are calculated to teach us, in case we had been ignorant of it. But it is not all he professes to teach. If he has not expressed himself in a way to conceal or

pervert his meaning, he wishes to establish the notion, that bilious malaria may be generated without the agency of either water or vegetable and animal relics. Speaking on this subject, he says, "as is the *dryness* of the soil, so is the *quantum* of sickness." In other words, *the drier the soil is, the more miasm it produces.* Render it therefore perfectly *waterless*, and you raise to its *maximum* its productive power. If this be not a correct interpretation of the Doctor's expression, and a fair inference from it, the fault is not mine. He ought to have used a less equivocal form of diction. Again, says our author; "one only condition, then, seems to be indispensable to the production of marsh poison, on all surfaces capable of absorption, and that is the *paucity* of water, where it had previously *abounded*." If this sentence has any definite meaning, it is as follows. *Wet sufficiently any surface capable of absorption, and suffer it to dry again* (in doing which you have in it a previous *abundance*, and a subsequent *paucity* of water) *and you*

will produce bilious miasm by the process. Is this true? No, certainly; every sophomore in medicine knows it is not. A bed of pure alumine, of calcarious or silicious earth, or even a pure but porous sand stone, constitutes a surface "capable of absorption." But the mere wetting and drying again of these, will produce no malaria. The fancy is absurd. When thus presented in its nakedness, Dr. Ferguson will not himself advocate it. Mix vegetable and animal relics with those articles, and then wet the impure masses, and suffer them to dry again, exposed to a hot sun; and, in the course of the process, malaria may be generated. But to produce it by our author's process is impossible. Other parts of the Doctor's paper are also at war with science. But being less relevant to the present inquiry, I shall not notice them. It may not, however, be amiss to observe, that an article of more merit, from an American pen, would have been less valued by a great body of American physicians. Our professional spirit is still colonial. It retains not a

little even of the *nursery*. An offering of food from the "mother country," no matter how indifferent its character and cooking, is prized above all that can be prepared at home. Although this is not true in every case, it is so to an extent that is humiliating. Thus the visions of Dr. Barry, about "venous circulation," became, for a time, and perhaps still continue, the "paramount law," with many physicians of the United States. Yet never were fancies more unfounded. But to return.

3. *What are the best means of preventing the formation, and removing the sources of malaria?*

To this great practical question, on whose solution, and the measures founded on it, depend the health and lives of millions, an answer may be rendered in a single word; CLEANLINESS. Nothing further than the preservation of this can be done, nor is any thing further necessary, to "remove (or destroy) the sources of malaria," which will, of course, "prevent its formation." All real filth con-

sists in a mixture of two of the elements of bilious miasm; water, and vegetable and animal relics. It has been already shown, that, without such mixture, that poison cannot be formed. The removal or destruction of the mixture constitutes cleanliness. By that process, then, I repeat, and by that alone, can the production of bilious malaria be prevented. Over atmospherical heat, in the warm climate of the United States, we have no control. It *will* visit us in the summer, and part of the autumn. Nor could we subsist without it. Our exemption, therefore, from the effects of the poison, can arise only from the adoption of proper measures, as to the other two elements of it.

Am I asked in what way the requisite cleanliness can be preserved? I reply that the process is different in different cases. Nor is it possible for me to treat the entire subject, in detail, without extending my Dissertation to a volume. I can do nothing more than speak, in general terms, of the means of preserving cleanliness in a few instances. Nor

is more requisite. The same principles are applicable in every case. When fully understood, therefore, they can be employed universally, without further instruction.

Man works wisely and successfully only when he imitates nature. As often as he opposes her, or deviates from her economy, he suffers disappointment, if not misfortune. Let him receive his lessons and procure his means of operation from her, and he will rarely fail to attain his ends. Her chief agents, in producing and preserving cleanliness are four; pure water, pure air, fire, and active vegetation. Add to these, certain large voracious animals, and hosts of small ones, that feed on carrion, offal, and other sorts of filth, and the catalogue is sufficiently full for my purpose. She never employs, with this intention, smoke, suffocating fumes, or strong and offensive odours. Nor ought man to do it. By the judicious management of the agents just enumerated, he can do all that is required of him, in the removal and destruction of nuisances injurious to his health.

Is personal cleanliness the object in view? By water, soap, and towels it is easily compassed. And in the removal of the causes of disease, and the general maintenance of health, it is a measure of much more importance than it is commonly supposed to be. I wish there were less ground to add, that it is too much neglected in the United States.

Is a house or a ship to be cleansed? Unite to the means just directed, brushes, sand, and free ventilation, and success, in most cases, is certain. Foulness beyond the reach of these can be subdued only by fire, which is competent to the purification of all things combustible. Smearing with lime, commonly called whitewashing, is but a slovenly substitute for real cleanliness. It conceals filth, but does not remove it. It is indeed but the substitution of one evil for another; a less for a greater; but still an evil. Yet it is one of the best means, in cases where the employment of water is forbidden by causes that cannot be controlled. But it should never be used for the purification of any thing

constructed of wood. Painting is a mode of covering filth equally effectual, and more durable. In all wooden fabrics, therefore, it is entitled to a preference. Whitewashing is a common expedient for the purification of foul ships, in quarantine establishments. So is fumigation by the combustion of certain substances, some of them odorous, as well as by gases otherwise produced. The practice is in both cases empirical. I know that this sentiment is not considered orthodox. Legitimacy and fashion, which too far sway the world, are against it. No matter. It is not, on that account, the less true. Orthodoxy is but opinion sanctioned by authority; but, in the present case, there is no divine right to dictate. What is the avowed object of whitewashing and fumigating? To neutralize febrile miasm, real or imaginary. If no such miasm exist, the practice is superfluous, and the time and means spent in it are thrown away. If it does exist, what are its nature and affinities? No one knows. To pretend to neutralize it, therefore, without such knowl-

edge, is palpable empiricism, not to call it imposture. It is as bad as the exhibition of a patent remedy to cure a disease, of whose seat and character the exhibitor is ignorant. The nostrum is as likely to destroy the patient, as to remove the complaint. The whole is haphazard and deception, and ought to be discountenanced by the friends of science. It checks rational inquiry, and retards improvement. Confidence in imaginary means is hostile to the discovery of real ones. It renders men content with the present, and improvident as to the future. True, we see certificates, from physicians, of the efficacy of fumigation, in cleansing foul and sickly ships and hospitals, and rendering them sweet and healthy. So do we of the infallibility of Swaim's panacea, in the cure of disease. And the testimony is as valid in the one case as in the other. In both, it is an offence against rational medicine. Combustion excepted, I repeat, that thorough washing and ventilation are the only certain means discovered, to purify foul and sickly

ships, and render them the abodes of cleanliness and health. Of hospitals and infirmaries the same is true. In them also painting and whitewashing are the best substitutes for real purification. They are, however, only substitutes, and should never be adopted but in cases of necessity. And they should be preceded by cleansing with soap and water, in every instance where no paramount reasons forbid it. As far as real purification is concerned, they are much more ornamental than useful. The cleanliness they produce is seeming rather than real.

There is no edifice that may not be kept sufficiently pure by the means here indicated. It is not only useless, then, it is injurious, to fill the wards of receptacles of the sick, with suffocating and irritating fumes and gases, to the annoyance and distress of patients with tender eyes and weak lungs. I have never seen a place thus fumigated, without exciting among the sick painful coughing, and other disagreeable affections. And if disinfection seemed to be the result of

the process, it was owing to the other means used at the same time, and not to fumigation.*

Is a city to be depurated of the filth which threatens to produce a pestilential disease? The work must be done by scavengers, carters, and watermen. The two former must remove the filth that lies in masses; and the latter must follow them, and wash away the remains. Mere scraping and shoveling do but little good. They remove what is un-

* Shall I be told, in objection to my opinion on this subject, that chlorine gas and some others destroy the fetid exhalation emitted by putrid animal matter, and in that way contribute to purity? The fact is known to me. But it is also known that such exhalation is not the febrile miasm of which I am treating. That poison exists, in its most virulent and destructive condition, unaccompanied by any odour. It does not follow, therefore, that because chlorine gas destroys the fetor arising from the dissolution of animal or vegetable substances, it will also destroy the poison. This loose substitute for reasoning is an abundant source of error and misehief. Nothing but an accurate and successful experiment is competent to prove that any known gas is capable of uniting with febrific malaria, and neutralizing it. And, as far as I have been able to inform myself, such an experiment has never yet been made. Hence the belief in the anti-miasmatic properties of the gases referred to is nothing but hypothesis.

sightly, and some of that which offends the smell, and there their action ceases, much of the nuisance still remaining. Water alone can carry that away. And to be efficient, the washing must be executed with a degree of care and accuracy greatly beyond what is generally observed in it. It might as well be entirely neglected, as performed in the usual slovenly manner. Forty-nine times out of fifty, filth enough is left in the streets and gutters of *one* city, to infect and sicken a *dozen*. Hence our constant summer and autumnal complaints. The process of cleansing fails in preventing disease, not because it is imperfect in its *nature*, but because it is *imperfectly performed*. Such indeed is the ground of most failures; faithless and defective execution, rather than unsound principle. Many more persons die from a partial observance or an actual violation of medical directions, than because the directions are erroneous or unwise. Even a bad system judiciously administered, is a less evil than the wisest system mismanaged or neglected. To the truth

of this, experience in every kind of government, whether public or private, abundantly testifies. Hence the lines of the poet may be received as a maxim;

> "For forms of government let fools contest;
> "That which is best administered in best."

Nor is this more obviously true, in any case, than in the cleansing of streets. If they be not thoroughly purified, they might as well be left untouched. Perhaps better. Filth, thinly spread over a wide space, is more deleterious, than when lying in a denser layer over a smaller space. This, with the reason of it, must be obvious to every enlightened physician. And, as practised by scavengers, the cleansing, so miscalled, is but little else than a *spreading* process. It extends the limits of the nuisance which it is designed to remove, by drawing feculence from the gutters into the streets. If the filth, being half an inch deep, be reduced to the twentieth of an inch, its power to injure is not lessened. It is from its surface, on which the heat immediately acts, and not from any distance beneath it,

that the miasm issues. I speak from oft repeated observation in declaring, that I consider street-cleaning, as usually performed, one of the most serious abuses committed against the inhabitants of a city. It begets confidence only to betray, and promises health only to destroy it. To be convinced that I speak truly, it is only necessary to follow and examine attentively the track of a gang of scavengers, when they are removing filth. They have evidently no correct knowledge of the purpose for which they are working; or if they have, they wantonly disregard it. In violation of their duty they leave much filth behind them, and thus endanger the public health. Unless this grievance be remedied, and real, instead of pretended purification be practised, we shall look in vain for any marked amendment in the health of our cities. Nothing but a thorough lustration will serve. True, compared with former times, the condition of cities, in point of cleanliness, is much improved. And the fact amounts to an argument. that nothing can

shake, in favour of the position for which I am contending. Their health is improved in an equal ratio. Authentic records tell us, that when London and other large European cities were visited frequently by pestilential diseases, their streets, squares, and dwellings, as well as their environs, were filthy almost beyond conception. I hazard nothing in stating my belief, that there exists not on earth a single city, that may not, by a strict observance by its inhabitants of a judicious course of diet and regimen, and a degree of cleanliness perfectly practicable to an efficient police, be rendered a safe habitation to man; I mean throughout the year. To this neither Grand Cairo, Aleppo, New Orleans, Havanna, nor any other city in tropical America constitutes an exception. But, to attain an end in all respects so desirable, the police must be enlightened, faithful and vigorous. It must be administered by officers who know what cleanliness is, how to appreciate it, how to produce and maintain it, and who will be vigilant and resolute in the per-

formance of their duty. And this is a spectacle I have never yet witnessed. Never have I seen the health of a city under the guardianship of a police that seemed either to understand the true meaning of *purity*, or to be willing to encounter the labour and trouble necessary to enforce it. I say "enforce;" for unless compelled to the observance of it, adults are as negligent of clealiness, on and around their premises, as children are; or as if they took delight in associating with filth. Nor does their carelessness escape with impunity. To this negligence much of their suffering from sickness is to be attributed.

No large city can be effectually purified, except under an arrangement, by which clean water can be made to flow actively along the gutters several hours every day. The degree of inclination of the streets, therefore, should be carefully suited to this purpose. Nor, during warm weather, should this mode of washing them ever be neglected. By means of it much filth will be carried off, which would otherwise remain, to

discomfort the inhabitants, and injure their health. There is, moreover, in the view of cool, limpid, running water, something exceedingly pleasant to the eye, and exhilarating to the spirits; a condition of things much more favourable to health, than offensive prospects, with dejection and gloom. It betokens purity; the very idea of which is valuable, and tends to produce the thing suggested. There is a much stronger and closer connexion between internal and external purity, than is generally imagined. The one is the natural expression of the other; and they impart to each other mutual strength.

Is the city checkered by vacant squares, public or private? Unless it be forbidden by insuperable causes, let them be enclosed with palisades or some other kind of open work, sodded or otherwise covered with grass, and suitably shaded and ornamented with shrubbery and trees. The addition of fountains and open reservoirs of water will greatly enhance their usefulness and beauty. Improvements of this description, when well

regulated and turned to the proper account, are not places of mere pleasure and luxury; they are means of real comfort, and sources of health. They are eminently useful, as a resort of children, for air and exercise, under the care of their nurses and attendants. Adults also may advantageously avail themselves of them, for the same purposes. Nor should their benign influence on health, as places of amusement, social enjoyment, and pleasing contemplation, be overlooked. Condsidered in all their qualities and bearings, they constitute a *rus in urbe* peculiarly desirable. Of the decorating of wide streets with rows of cleanly and beautiful trees, I am inclined to think favourably, for similar reasons.

Although, as heretofore mentioned, I know of no instance, in which cemeteries, slaughter-houses, tanyards, or factories of soap, glue, or candles, have injured the public health, yet they ought not to be situated in central or thickly inhabited parts of cities. To say the least of them, they are unsightly

and disagreeable establishments; and admitting that they do not send forth *febrile* miasms, they certainly adulterate the atmosphere by their effluvia. It is alleged, moreover, and I apprehend not without cause, that cemeteries sometimes contaminate the waters of adjacent wells. Prudence, therefore, concurs with a love of cleanliness, in admonishing that all such places be without the city.

Much has been said and written to prove the bad effects of privies on the health of cities--more perhaps than, within the last and the present century, is true. When those places were above ground, and openly exposed, as was the case in former times, their pernicious influence could not be doubted. But constructed under ground, as they now are, and securely covered, they can scarcely, I think, be considered injurious to health. But they must be kept clean. I mean that their contents must not be suffered to rise near to the surface of the earth. If they be kept five or six feet, or perhaps even a shorter distance,

below it, and are sufficiently covered by a well constructed building, the temperature of the air in contact with them will be too low for the production of miasm. The amount of liquid, moreover, which they usually contain, is too great for that effect. But if not properly constructed, privies are much more likely than burying-grounds to adulterate the wells that are near to them. To prevent this, they should be lined with stone or well burnt bricks, cemented with water-lime. This will form an impervious barrier to the escape of their contents, and render them harmless.*

* To common sewers in cities similar remarks are applicable. When skilfully constructed they are not dangerous, as sources of disease. Give them sufficient depth, width, and descent, line them with brick or stone and water-lime, and make no more openings into them than are necessary, and they will send forth no miasm to adulterate the air. Their depth and covering will protect their contents from summer heat, and their width and descent will prevent stagnation. Under these circumstances, putrefaction cannot take place in them. Nor, if it did, could the gas produced by it escape, in any injurious amount, except by means of too many openings. Sewers thus prepared may be kept so clean by currents of water being made to pass through them, that they can create no sickness. Nor will they

As relates to this point, however, a general system of water-closests, such as that which exists in London, is preferable to every other mode of cleanliness.

I know it is contended by many, that, whatever may be its accumulation or degree of exposure, human ordure cannot, under any circumstances, be converted into a source of febrile miasm. But I also know that the opinion is destitute of proof. All the facts adduced in support of it are necessarily of a *negative* character. Nor do they bear the slightest resemblance to negatives in grammar. No number of them that nature may present or industry collect, can ever make a *positive*. They therefore prove nothing. To establish *probability* is the utmost they can effect. As relates to the present topic, in

contaminate wells or fountains in their neighbourhood, by the percolation of their contents. Let them be sufficiently numerous to convey from the city its foul waters, and other recremental matter, and, they will contribute greatly to the preservation of health. They will act like drains in marshy ground, the benefits of which will be spoken of hereafter.

every negative case that can be adduced, circumstances may have been wanting, which, had they been present, would have altered the result. But admit that human ordure alone cannot be rendered productive of malaria; the fact does not militate against my position. It is well known that, in cities, privies are made receptacles of other kinds of filth and feculence that may produce it. By neglecting them, therefore, health is endangered.

Is the city commercial and situated on navigable water? Let not the wharves be built exclusively of wood. Their facing at least should consist of stone or brick, else they will become, in time, masses of dissolving vegetable matter, and abundant sources of febrile miasm. That the cities of the United States suffer, in their health, from this cause, cannot be doubted. Piles of decaying timber, alternately wet and dry, and exposed to the ardour of an American summer sun, must produce malaria, as certainly and naturally, as the influence of spring promotes

vegetation, and the rigors of winter suspend it. In places where the tide rises and falls six or eight feet, it is not uncommon for the docks to be so shallow, that the immense beds of filth they contain become bare, and are exposed, during low water, to the action of the sun. While in this condition, the exhalation from them is often intolerably noisome and sickening. The filth accumulated in them, moreover, is usually of the very worst character. It consists of the vilest feculence, washed from the streets, alleys, and other places still more foul, by rains, and water from other sources. When exposed, therefore, and acted on by the sun, it were superfluous to say, that it constitutes a laboratory of malaria, as fertile and threatening, as imagination can conceive. I could name a city that has suffered greatly from this cause. The docks should be so deep, then, as to have their bottoms always covered with eighteen inches or two feet of water. Nothing short of this can protect the city from the nuisance referred to. Appealing so strongly and offensively as it does to

our sight and smell, to say nothing of our reason and sense of danger, the neglect in relation to it is surprising. The importance of remedying the evil, where it exists, cannot be too frequently or forcibly impressed on the guardians of the public health. It is believed that wooden wharves exposed to *fresh* water, are more pernicious, in their influence on health, than when the water is *salt*.* But they are pernicious in every case, and should be therefore exchanged for brick or stone. Although they are not individually so serious a nuisance as foul and shallow docks, they are oftener met with. Their excess in number, therefore, so far tends to make the balance even, that perhaps they constitute, in mass, as great an evil.

* It is contended by some, on the authority of Sir John Pringle, that a small quantity of salt accelerates putrefaction; and that therefore timber and other vegetable matter wet with the water of seas and bays pass to dissolution more speedily than when wet with the water of rivers. This is a mistake. Salt never accelerates putrefaction, but always retards it. In its mode of effecting this I take at present no concern. The fact is sufficient for my purpose; and that is certain. It is known to mariners that ships decay sooner in fresh water than in salt.

Tile and slate make a much better covering for city edifices than shingles. To say nothing of their greater durability, and the superior protection they afford from fire, they are exempt from dissolution, and do not contaminate the atmosphere around them, nor the rain that falls on them, to be afterwards received into cisterns for use. Of wooden coverings the reverse is true. Under the process of decay, they adulterate both air and water. Shall I be told that this is a very limited source of mischief? I know it; but it does mischief; and that justifies my reference to it. I do not call it great; but I say that masses are composed of molecules, and that it therefore adds to the aggregate of the evil. The collective mischief done to us through life, by small evils, which we neglect because they are small, surpasses that we experience from larger ones.

Is a fenny or marshy tract of country to be cleansed from the materials productive of malaria? A process must be instituted, founded on the same principles, but different in

form and mode of execution from those just described. The entire scene being dissimilar, the success of the attempt to cleanse must depend, as in all other instances, on its correct adaptation to the nature of the case. It is to consist in sufficient draining and banking, and the judicious cultivation of the soil. The channels formed in the process, therefore, must have such an inclination, that the water they contain shall flow freely. Marshes and fens must be thus converted into fields, meadows, and gardens; and places where filth lay exposed and reeking with poison, must be clothed in dense and vigorous vegetation. This mutation of surface moreover must be general. To make it only in parts is little better than lost labour. A few neglected spots, although they are small, will baffle hope and frustrate expectation, founded on the cultivation of many larger ones. By the process here directed, man subserves a twofold interest. He accumulates riches, and secures health. That from which neglect would distil a poison, industry turns to gold;

and the vegetation sustained by masses of pollution, renovates the atmosphere, and renders it healthful. For vegetables not only feed on air that is foul, but send forth an abundance of that which is pure. In the course of improvement it is often found necessary to narrow and deepen wide and shallow streams by artificial banks. This change not only confines the water within more circumscribed limits; it accelerates its motion, and in that way contributes to the general effect. Other things being equal, the swifter the current of a stream, the less febrile miasm arises from it. To aid in forming that poison, water must stagnate.

Am I called on for an example to prove, that the mode of cultivation here recommended, can give health to the inhabitants of a sickly district? The summons is fair; and I answer it by pointing to what is called the Neck; a large body of land adjoining the city of Philadelphia, on the south. Half a century ago, that tract was but little better than a great morass. It was cultivated and in-

habited only in spots. Nor did the Pontine marshes surpass it much in the extent and violence of its annual disease. It filled the Pennsylvania hospital with dropsies and other sequelæ of neglected or unskilfully treated bilious affections. But time and labour have converted it into meadows, fields, and gardens, rich in the products of the several kinds of cultivation pursued. It is grazed on, in parts, by herds of cattle, as fine as any the world exhibits. And the Philadelphia market receives from it an abundance of the choicest kinds of fruit and vegetables. Nor does it flourish more in vegetation than in health. Its population is now dense. "Every rood" of it may be almost said to "maintain its man." And instead of the pallid cheek and languid movements, which characterized their predecessors, its present inhabitants exhibit as much of the sunburnt bloom, and vigorous limb, as belongs to the healthiest of their upland neighbours. Add to this, that instead of being poor, as formerly, they are prosperous and comfortable. Such is the happy re-

sult of draining and banking, planting and sowing. In many other parts of our country that might be mentioned, the same process has uniformly led to a similar result. Nor can it fail to do so every where, until the laws of nature change. While filth shall continue a source of disease, and cleanliness the reverse, so long may the inhabitants of any place do, what those of the Neck have already done—redeem health, and render fens and marshes more profitable than mines of gold or silver.

Another very impressive instance of the happy effects of cultivation in reclaiming a swampy and sickly district to healthfulness and prosperity, is derived from the history of Calcutta, and the country around it. That city, built in a morass, on the banks of the Hoogly, was originally a speedy and almost certain grave to the Europeans who resorted to it for purposes of commerce. But a well regulated police within, and the thorough cultivation of the environs without, have rendered it as healthy as any other city in a

warm climate. The same is true of Barrackpore, Serampore, Chandernagore, and many other places in the province of Bengal. They were once sickly, but have been rendered healthy by means of cultivation. Bourdeaux furnishes another memorable example to the same effect. When surrounded, as it once was, by marshes, it was one of the sickliest cities in France. Bilious fever prevailed in it as regularly, and almost as violently, as it does in the vicinity of Rome at present. But the marshes became cultivated, and it and the country around it are healthy.

In fine, then, there is not on the shores of the Chesapeak, or the banks of the Mississippi, nor on any other shores or banks, in the United States, a tract of fenny land, susceptible of redemption from the water by drains and levees, that may not be rendered inhabitable and healthy.* But to effect this, the

* It is not contended that all places susceptible of draining and cultivation can be rendered equally healthy. But they can be rendered places of comfortable abode. The

cultivation, as already mentioned, must be complete. Half-done business, I repeat—and it can scarcely be too often repeated—is generally worse than neglect. It allures and encourages only to disappoint, and begets confidence only to betray. When the country around Edinburgh was in a half-cultivated condition, it was visited annually by intermittents and remittents. But in its present state of high cultivation, it is free from them.

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low-lands of the Carolinas, and I believe also of Georgia, are much healthier now than they were at the close of the revolutionary war. The cause is obvious. They are under higher cultivation. At the period referred to, white men could not labour in them, and retain their health. Negroes were therefore necessary, But they are less necessary now. In thirty years more, perhaps within a shorter period, they will not be necessary at all. White men will do their work to much more advantage. By that condition of things the abolition of slavery in our country will be facilitated. Like other evils, human bondage will disappear under the progress of improvement. But, in the present case, the event, however desirable, cannot be hurried without producing a worse evil.

As relates to North Carolina, a fact has been ascertained, which proves the uncommon healthfulness of the State. By the late census it appears, that the population of that

Of the country in the neighbourhood of London the same is true.

Is it required of me to present a picture the reverse of that exhibited in the case of the Philadelphia Neck, and the region in which Calcutta stands? I find it in the Pontine marshes. That spot was once the paradise of Italy—perhaps of the world. It was studded with resplendent villas, the summer residence of the wealth and fashion of Rome, and the chosen abode of health. Its halls were therefore crowded with blooming inhabitants from the city, and mirth and music

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Commonwealth amounts to 738,470. Of this number of individuals, 304 have attained the age of 100 years and upwards. This gives a centenarian in every 2425 persons throughout the State! What will Mr. Godwin and other Europeans who deny American longevity say to this? Will they persevere in proclaiming us a degenerate race? Can 304 centenarians be found in every 1,000000 of the inhabitants of Great Britain or France? I do not possess facts sufficient to justify me in speaking positively on this point. But I doubt exceedingly, whether the proportion of persons, who attain to the age of 100 years, is half as great in either of those countries, as in North Carolina. Yet that is not the healthiest state of the Union.

resounded through its groves. May records moreover be credited, scarcely did its clustering roses exceed in freshness its native daughters. But, mark the contrast. It is now, as its name imports, a waste of marshes, its palaces overthrown, and replaced by the huts of a few wretched peasants, whose only refuge from poverty and sickness is an early grave. The human voice is scarcely heard in it, except to moan. Such are the pictures, past and present, of that celebrated place. And to what cause is the contrast to be ascribed?—Difference in cultivation, at the periods referred to. When it was the abode of health, it was the abode also of industry and enterprise, which drained it of its waters, and clothed it in vegetation, and thus prevented the formation of the seeds of disease. But indolence and neglect succeeded, and their kindred train of evils followed. The waters resumed their ancient places, ornamental and protecting vegetation perished, and in its stead arose aquatic plants, to turn to dissolution, and aid in the production of febrile mi-

asm. And disease again prevailed. Similar changes have occurred in the town and settlement of Fultah, on the bank of the Hoogly, below Calcutta. In consequence of a high state of cultivation, that place, rescued from a marsh, was once as healthy as any in India. But, through neglect, its original uncultivated condition has returned, and the jungle fever renders it now almost uninhabitable. A similar misfortune occurred to *la ville-neuve les avignon*, which is situated on one of the branches of the Rhone. In former times, that town was celebrated alike for its healthfulness and beauty. But the embankment of the river on which it stands giving way, its environs were flooded, and converted into a marsh. This event soon rendered it as remarkable for sickness, as it had been previously for health.

Such, in obedience to the eternal laws of cause and effect, are the changes in salubrity, which must always accompany similar changes in the cultivation of marshy tracts of country. Industry and thorough

cultivation will be rewarded with health and plenty, while the lot of neglect and defective cultivation will be sickness and poverty. Allow the Philadelphia Neck to fall back under the dominion of water, weeds and mud, and, like the Pontine marshes, it will be again under the dominion of bilious fever; and its inhabitants will, a second time, suffer alike from disease and indigence. It is worthy of remark, that, in redeeming a marshy district from sickness, it should be put under a covering of vegetables that require but little irrigation. For this reason the rice plant is unsuitable; and a dense mat of meadow-grass is the best. Next to this are timothy, wheat, and rye. Clover is also admissible.

The bad effects of an immature cultivation of the soil are further manifested in the succession of events that usually marks the settlement of new countries. The land being fertile is covered with a heavy growth of grass, underbush, and forest timber, which protect it from the sun. Under these circumstances no febrile malaria can be form-

ed, because the surface of the earth, where the vegetable relics and moisture abound, is wanting in temperature. The settlers arrive, erect their cabins, and, for the first season, continue healthy. But this state of things cannot last. The earth is to be cultivated; and the cultivation must at first be immature. The axe and the mattock having removed the larger and smaller growth of timber, and the plough having furrowed the surface of the soil, the sunbeams get access to the moist vegetable mould; because as yet the crop of cultivated vegetables is not sufficiently dense to protect it. All the elements of malaria being thus brought together, the consequence is obvious. The poison is formed, and enters on its work. Hence, during the second summer and autumn of their residence in their new places of abode, the emigrants begin to suffer from the sickness called a seasoning. Nor does the evil immediately cease, in as much as the causes continue to operate, for a time, with a force but little diminished. At length, however, the condition

of things changes. The cultivation of the soil being matured, its rawness and superabundant humidity disappear, and the growth of domestic vegetables becomes sufficiently close and heavy to protect the surface of the ground from the rays of the sun, and perhaps to appropriate to its own use the matter that would otherwise turn to miasm. For that matter becomes no doubt the food of the plants. The issue has been already told. The malaria of defective cultivation disappears with the state of things that produced it, and the primitive healthfulness of the country is restored. If fens or marshes exist, they are drained and converted into meadows, which more completely secures the salubrity of the place. In further illustration of the principles here maintained, it may be observed, that hurtleberry and cyprus swamps, with all fens and marshes deeply shaded, never produce malaria. Why?—Possibly for two reasons. They contain too much water; and the protection of their surfaces from the rays of the sun renders them too cool for the pro-

cess. Admit the sunbeams, by the removal of their leafy covering, and miasm will be formed.

Mill-ponds are often a fruitful source of malaria. Can any alteration be made in the mode of forming them, calculated to lessen or prevent the evil? I think there can.

The amount of mischief done by a mill-pond, other things being alike, is in proportion to the quantity of vegetable matter, which it subjects to dissolution; and that again is usually determined by the extent of land that is flooded by the obstructed water. Two measures, therefore, present themselves for diminishing the evil; and either or both may be adopted, according to circumstances. In all cases the forest timber and underbush, covering the ground to be overflowed, may be cut down, grubbed up, and burnt, or otherwise removed, before the erection of the dam. Under this regulation, much less vegetable matter will be dissolved. And, in many instances, the construction of a *levee* or artificial bank, of a moderate height and

extent, will confine the stagnant water within narrow limits; and thus will only a small portion of land be flooded. That these measures would prove useful, cannot be doubted. The erection of *levees* would even add to the efficiency of the establishment, by giving a better head of water, than could be had without it. Nor do I perceive that any objection to it can be reasonably urged. The expense attending it would rarely be very heavy. And if, in some cases, it should be so, what is the pecuniary interest of a few individuals, when balanced against the health and lives of thousands? That the removal of the timber and underbush from the flooded ground would be salutary, is proved by the fact, that old mill-ponds are much less deleterious than new ones. The reason is plain. From the former, vegetable matter is removed by decay. In the latter, it abounds; and, while undergoing dissolution, produces malaria. To the precautions here suggested. add the planting of rows of shrubbery and trees along the *levees* or edges of mill-ponds.

the benefits of which will be again referred to, and it is believed that the evils of those establishments will be greatly diminished. They will be rendered not only innocent, but ornamental. They will resemble the willow-fringed lakes and fish-ponds of European parks and pleasure-grounds, and be no longer dreaded as laboratories of poison.

4. *When malaria is already formed, how may its effects on the human constitution be most certainly obviated? In other words, what are the means, by which the inhabitants of a city, or a district of country, subject to bilious fever, may best preserve their health?*

Are these questions proposed to an honest and enlightened physician, by those who have confided to him the care of their health? He can render to them, in conscience, but one answer; "Withdraw from the sickly region, during the sickly season. Nothing short of this will certainly protect you." But the few only can follow the advice. The many, being destitute of the means of removal, or

prevented from it by indispensable business, must abide the evil. To these, therefore, the following remarks may perhaps communicate some useful information.

It is a maxim in pathology, that during the prevalence, whether endemic or epidemic, of a bilious fever, every inhabitant of the sickly district is predisposed to the disease. Nothing but an exciting cause is necessary to its production. Let such excitement, therefore, be strictly avoided. Am I asked what I mean by exciting causes? I reply, every thing that can produce fatigue, or any kind of exhaustion; every impression out of harmony with the system. In other and plainer words, improper exposure, intemperance, and all sorts of excess. Some of the most powerful exciting causes are, fatigue from severe or protracted exercise or long endurance of inordinate heat, sudden and great vicissitudes in the atmosphere, especially from a higher to a lower temperature, and from dryness to moisture, unguarded exposure to a current of cool air, a shower of cold rain, the evening

dews or the common humidity of the night air, more particularly if the person be exposed in a posture of rest, in which case, should he fall asleep, the evil is increased; dampness and coldness of the feet, and even of the hands if long continued; stunning and weakening injuries from blows or falls, inordinate indulgence in love, the influence of the other passions generally, more especially the passion of fear, and the action of intense and long continued study. To these add, excess in eating, drinking, and watching, the use of crude and indigestible food at any time, but particularly just before retiring to rest, deep anxiety or dejection of mind, and the swallowing of irritating and nauseous pills and potions, as preservatives of health. Such, I say, are some of the most dangerous exciting causes, which should be studiously avoided, by all who are anxious to escape disease. But these are only passive duties of prevention. There are also active ones to be performed.

If individuals escape a prevailing epidem-

ic, next to their avoidance of exciting causes, they owe their safety to the prophylactic power inherent in their constitutions; that power denominated by the schools *vis conservatrix naturæ*, whose province is to resist the influence of deleterious agents, and preserve health. Nor is this conservative attribute, as many have pronounced it, a creation of fancy. It as certainly belongs to the human system, as the power to breathe, to secrete bile, or to digest food. If it did not, health could not be maintained a single hour, by individuals living, breathing, and swallowing, in the midst of a virulent atmospherical poison. On this point I am anxious to be clearly understood. By the *vis conservatrix naturæ* I do not mean any separate and peculiar entity or principle attached to the constitution, as a guardian of health. I do not identify it with the *anima medica* of Stahl. That would be a hypothesis too fanciful for the sober sense and practical views of the present age. I mean only a given and peculiar mode of action of the

general powers of the system, or rather of its organs possessing power, adapted to its existing exigency. As are the exigency and demand of the system, for the time being, so is the mode of action. Is food to be digested? The brain and all the other leading organs combine to aid the stomach in its work. To prove this would be easy, were it admissible in me to dwell on it. If those organs are feeble or diseased, and unable to furnish aid, the work is not suitably performed, the stomach alone not being competent to it. Is matter to be secreted, to produce the reunion of a broken bone? The general system must aid the part immediately affected, and especially destined to the work of secretion, or the process will fail. Hence, under the existence of constitutional disease or debility, a broken bone does not reunite; at least it does so, if at all, slowly and defectively. Does any other form of disease exist? The powers of the system must concur to remove it, or it will not be removed. Medicinal substances, unaided by those powers, cannot

cure it. To enlightened physicians this is but a truism. They know that medicines are literally but the handmaids of nature. In like manner, when the system is assailed by febrile miasm, its powers must confederate to resist the poison, or disease will ensue, as certainly as ponderous bodies, when unsupported, fall to the ground, and those that are lighter than the atmosphere pass upward. And this confederacy is what I understand by the phrase *vis conservatrix naturæ*. The philosophy of all this I waive, the fact alone being sufficient for my purpose. I do not know that this explanation is necessary, on the present occasion. I trust, however, it will not be deemed irrelevant or improper. My chief reason for offering it is, that, when speaking on the subject, I have been often misunderstood; and I am solicitous that this should not be the case now. On this topic I shall only add, that, were it not for the attribute, of which I have spoken, no exciting cause would be requisite for the production of bilious fever. The poison alone would be competent to the effect.

Man escapes, then, I say, from the influence of bilious malaria, when he does escape, in consequence of the resistance of his conservative power. And, other things being equal, the more perfect his health is, the more successful will be the resistance. This may be considered another axiom in pathology, whose applicability to the subject in question is plain, as will appear presently.

Different and even opposite opinions are entertained, and corresponding directions given, with regard to the kind of diet and drink most suitable to individuals, as relates to their protection, during the prevalence of a bilious epidemic. Some physicians advise the entire abandonment of animal food and stimulating liquors, and the substitution of vegetable aliment and water in their place. This, we are told, is to purify the blood, and render it insusceptible of the febrile poison. Others pronounce this course too debilitating, and therefore calculated to invite disease. Accordingly their directions are, to eat more animal food, accompanied by more stimula-

ting condiments than usual, and to drink more freely of vinous and spirituous liquors, in order to escape the sickness, by "living above it."

I apprehend both sets of directions are equally wrong. Sudden and great changes of diet and drink are hazardous at all times, and under all circumstances. But they are peculiarly so during the prevalence of disease, when the constitution requires all its stability and firmness, to enable it to resist the febrile miasm. But an immediate and striking change in food and drink necessarily deranges the constitution, unsettles its economy, and weakens its powers. It requires of it a new order and degree of action, to accommodate itself to its new condition. It alters moreover its susceptibilities. In conforming to this new state of things, the constitution must abandon the old; and, in its transition from the one to the other, it cannot fail to be temporarily enfeebled. In the mean time the malaria, plying its powers, gains an ascendency, and disease is produced. The condition of the human system, when in this

transition state, resembles that of an army engaged in action, whose battle-array an unskilful commander imprudently changes, in the face of an enemy, who, taking advantage of it, makes victory sure. Or it may be likened to the condition of a ship in a gale. Her storm-stay-sails are set, and her helm lashed fast, and she is riding out the blast in safety. But the wind suddenly shifts, and renders another state of preparation necessary. Her present array, therefore, is broken up, that the other may be formed, and she is thrown loose, for the time, into the wind. The peril is great, and the issue often fatal. Before the new arrangement can be completed, the vessel may be overwhelmed and the crew lost.

I do not think it safe for those exposed to it to make any material change in their mode of living, during the prevalence of a bilious epidemic; I mean, provided they have lived temperately. For the intemperate I have no other advice, but to return to sobriety, at every hazard. Better to die in temperance, than live in debauchery. Let the temperate,

I say, adhere to that mode, which they have found, by experience, to be most subservient to perfect health, and that will give them the greatest security against the influence of malaria. It will impart to their preservative power the greatest degree of vigour. Have they lived on vegetable food and water, and have these articles proved most salutary to them? Let them adhere to them. Has their food been animal, and their drink fermented or distilled liquors; and have these given them the highest health they have enjoyed? It would be indiscreet to change them. Nor, under the same proviso, ought they to make any alteration in diet and drink of a middle character; more stimulating than the former, and less so than the latter. The end aimed at is entire health, and whatever kind best secures that should be steadily persevered in. This, if I mistake not, is the dictate of common sense and experience; while the directions to change, as just specified, are the offspring of hypothesis. They are predicated on the assumption, that their

authors know what state of the blood gives a liability to disease, and what a security from it; whereas, in fact, they know nothing of the matter. They do not even know that any one state of the blood, independently of the condition of the solids, is preferable to another, as relates to the liability of the system to be injured by malaria. Nor have they the least knowledge how that fluid is affected by different kinds of aliment and drink. The whole is conjecture. But we do know that the more perfect the health is, the more vigorous is the resistance of the system, when assailed by any deleterious agent, and the less of course its liability to be injured by it. Should any slight alteration, however, in diet and drink be made, let the change be to articles that are lighter and less stimulating, rather than to those that are heavier and more so. In an especial manner, let heavy and stimulating food and drink be abstained from, during a state of exhaustion from excessive exercise, or long exposure to intense heat. In such a case, every thing

taken should be cooling, light, and easy of digestion. The system calls for quietude that it may recruit itself, not for irritation by diet and drink, to exhaust it still further and more injuriously.

Clothing and exercise, judiciously regulated, are of great value, as safeguards from disease. The former should be such as may best maintain the healthy action of the skin, and protect it against sudden vicissitudes in the atmosphere. Let flannel or muslin, therefore, more especially the former, be worn next to it in preference to linen. The action of this kind of cloathing is much aided, and its beneficial effects promoted, by perfect cleanliness of the skin, and the frequent use of the flesh-brush, or by frictions with a coarse dry towel, or a roll of flannel. Rubbing the surface of the body and limbs occasionally with dry salt, finely pulverized, proves highly useful, by maintaining healthy cutaneous action. The feet, in particular, should be carefully guarded against cold and moisture, which is also best done by woollen

or cotton. The other articles of dress ought to conform to these. The end aimed at is to keep the body in an equable and comfortable temperature. Let the warmth preserved, however, be above the *punctum jucundum*, or point of pleasant feeling, rather than below it. Woollen clothing generally, therefore, accommodated in its texture to the character of the weather, should receive a preference.

Exercise should never be turned into labour. It should not, I mean, be so violent or long continued, as to induce fatigue. The intention of it is to invigorate and strengthen, not to exhaust and enfeeble. When it is judiciously accommodated to this end, health is confirmed by it. It should be taken daily, in the open air, when the weather is favourable, and, if practicable, without the sphere of the malaria. Walking and riding on horseback are greatly preferable to "airings" in a carriage. The latter are well named. They are *mere airings*, and nothing more. They do not amount to exercise, except for inva-

lids, who can sustain no other sort of gestation. Sitting or lolling in a carriage is, at best, but a sedentary occupation. Exercise should be taken in the cool, but not the humid portions of the day. During the heat of the day it may prove dangerous, and should, if practicable, be avoided. Nor ought it to be indulged in immediately after eating, especially after dinner. Exercise, when the stomach is loaded with food, is never salutary. Nature herself admonishes of this. Hence the drowsiness and indisposition to motion felt, soon after meals, both by man and the inferior animals. The dog lies down to sleep, and the ox to ruminate; and man, if he has leisure, retires to his *siesta*.

Does bilious or yellow fever prevail in a city? There are yet other precautions which have been found useful as means of prevention. Respecting the malaria of those complaints, two important truths are known. It does not rise to the highest stories of lofty city dwellings; at least it does not reach them in a state of full concentration and strength;

and exposure to it at night, especially during the inaction of sleep, is much more dangerous than exposure during the day. On these two facts, valuable measures of safety may be founded.

Are individuals compelled, by business or duty, to pass the day within the sphere of the miasm? Let them, if practicable, sleep without it, at night, and they may escape mischief. Or if unable to avail themselves of this precaution, let them adopt the next best, which is to pass the night in the upper stories of their houses, above the reach of the enemy. Let them indeed spend all the time they can in those stories, and they may be safe. This is no hypothesis. The practice recommended has been successfully tried. It is founded on principle, and, if generally adopted, cannot fail to do good; although it may not, and I presume will not, protect from disease in every instance. When Europeans, in the cities of the east, retire to their domestic quarantine, to escape pestilence, they confine themselves strictly to the higher floors of their

houses. Their real intention in this, is to maintain a position as remote as possible from such persons, affected with plague, as may pass along the streets. Thus, in their opinion, they escape contagion. But they act wisely from mistaken motives. There is no contagion in the case. Plague is no more contagious than yellow fever. Escape is to be accounted for on a different ground. The malaria of plague does not rise to a great height in the atmosphere. Europeans, therefore, confined to the upper stories of their houses, are above the reach of it. Those who reside on the lower floors, however strictly they may seclude themselves, do not so generally retain their health.

The same miasm which produces common bilious and yellow fever, produces alsc cholera infantum, a complaint which prevails most in our large cities, and might there be denominated *pestis infantum.* It is known that the best and only certain means to protect infants from this disease, is to allow them to pass the summer in the country. But there

are not many cases in which this is convenient. In lieu of it, therefore, if the subjects to be protected cannot be allowed to sleep in the country every night, during the summer months, which would be the second-best plan of security, let them enjoy the third, which is to pass their nights in upper stories. Let them pass the day there also, except during the hours of exercise in the open air, when they ought, if possible, to be removed without the limits of the malaria. A few hours every day spent in the pure air of the country, would aid much in maintaining the vigor of their systems, and in protecting them from disease.

Again. It is known to every one who has attended to the subject, that, in districts of country where bilious fever occurs, as an annual endemic, other things being alike, those who sleep in upper stories are less liable to the disease, than those who pass their nights below. Nor is this all. In the places of which I am speaking, the inhabitants find no inconsiderable security from the endemic, by

erecting their houses on artificial mounds thrown up for the purpose. This practice is pursued in some of the sickly portions of the United States. And were the mounds made higher than they usually are, the security derived from them would be greater. True; the professed object of the inhabitants, in thus elevating their buildings, is to raise them above the common humidity of the soil, and in part above the ascent of the dew. But they aim at one end that is good, and attain another that is better. They live, and especially sleep, above the flight of malaria; and hence chiefly their safety arises. To escape from the dew, and other forms of moisture, is advantageous; but to keep out of the reach of the miasm is much more so. The former is but an exciting cause, and can do comparatively but little mischief, unless the latter has invaded the system, and produced a predisposition to disease.

There are yet other precautions which may be advantageously practised, by the inhabitants of places where bilious fevers prevail.

They are especially applicable to sickly situations in the country. It is hazardous to go out in the morning with the stomach empty. Regular breakfast, or some gently stimulating and cordial beverage, accompanied by a cracker, or a bit of bread, should be first taken. For the purpose in view, nothing perhaps is better than a cup of coffee, chamomile tea, or some other mild aromatic bitter. In the aguish countries of England a glass of table-beer, with perhaps some bread, is the usual substitute, and is no doubt a good one. In other places cider is used, it is said with beneficial effects. But wine and distilled liquors should be avoided. They are too stimulating for the end desired, and very often lead to intemperance. One of the most injurious and offensive practices in our country, and which brings down on us deservedly the reproach of foreigners, is that of morning dram-drinking. Nor does it afford protection from malaria. Nothing we swallow can do that, unless it gives real strength, primarily to the stomach, and by sympathy

to the conservative powers of the system. But such are not the effects of morning drams. They rouse the stomach to preternatural action, for a time, only to sink it deeper in exhaustion. It is a disquieting sense of this that leads to a repetition of them, until intemperance is the result.

Is any one inclined to ask me, would not bread and cheese, with a draught of water, or a breakfast of bread and milk, protect from malaria as well as coffee, beer, or cider? To this question I am not prepared to answer in the negative. Perhaps an affirmative reply would be nearer the truth. But the experiment alone can answer definitively. And I know of no instance where it has been decisively made. For many years before his death, the late Dr. Tilton, of Delaware, breakfasted on the product of his own ground. If I mistake not, the meal consisted chiefly of fruit, bread, and milk. Yet he enjoyed perfect health, and attained a very advanced age. On this topic I shall only add, that were our "Temperance Societies" to denounce ex-

cess in eating as well as in drinking, marking with equal dispprobation the use of *improper* food, and setting correct examples themselves in relation to the whole, the prospect of a thorough reform would be much brighter than it is. A very frequent cause of intemperate drinking is intemperate eating, connected with the use of indigestible aliment. And for every drunkard in our country, we have a hundred gluttons, if, by that term, we mean those who eat too much. Nine hundred and ninety-nine out of every thousand persons in the United States eat to excess, and suffer by the practice.

Like other matters floating in the atmosphere, malaria travels with the wind. It therefore does mischief on the leeward side, at a much greater distance from its source, than on the windward. Suppose it indispensable that a dwelling, fortress, or town be built near to a marsh that cannot be immediately drained and cultivated, and that the prevailing summer and autumnal wind of the place is from the southwest. Let the buil-

dings be erected on the same side. Why? Because the wind will carry the malaria *from* them, and their inhabitants will be healthy; while it will convey it directly *to* them, if they occupy the northeast side, and they will suffer from sickness. Hence the well known fact, that in the southern section of the United States, where the prevailing winds of summer and autumn are from the south and west, the dwellers on those sides of marshes, swamps, rivers, and mill-ponds, are often in the enjoyment of good health, while the people on the opposite sides, although further perhaps from the laboratory of the poison, are victims to fever.

Another precaution, by which a town or single dwelling may be protected from the malaria of an adjacent marsh, is the interposition of a cordon of trees and underbush. If a growth of such timber, therefore, be already standing between the marsh and the buildings, let it remain; and if it be wanting, plant it. Trees of moderate elevation, with bushy tops, and which throw out limbs and

foliage along their trunks, are best suited to form the barrier required. Many places in tropical climates have been rendered uninhabitable, by the felling of trees and the destruction of underbush between them and neighbouring swamps and marshes; and their salubrity has been restored by the regeneration of the timber. In the United States similar events have occurred. The evidence on the subject is therefore complete. This mode of obstructing the march, and obviating the mischief of malaria, has been practised time immemorial in Persia and other oriental nations.

Would a lofty wall arrest the progress of malaria, issuing from a neighbouring source? I doubt not it would. Facts seemingly to that effect exist. The plague of Moscow found its way in but few, if any instances, within the walls of the Kremlin. I think, but cannot, on this subject, speak confidently, that the prisoners in the Philadelphia jail remained healthy, during the prevalence of yellow fever, in that city, in 1798. Yet the disease, during that season, spread in all di-

rections around the prison, where any inhabitants remained.

The uninterrupted health of the inmates of monasteries and nunneries, enclosed by walls, during the devastations of pestilence around them, is almost proverbial. It has been ascribed to different causes; strict temperance in diet and drink; general regularity of habit; exemption from strong and irritating passions; and a life of seclusion, leading to an avoidance of contagion from the sick. That the three former of these causes acted as means of protection from disease, cannot be doubted. But that the latter did not is equally certain, in as much as there was no contagion in the case. Others have regarded the escape of the meek recluses from pestilence, as a special blessing FROM ABOVE, on account of their piety. Persuaded that Heaven always stays natural calamities by natural means, I cannot abandon the belief, that the surrounding walls, which shut *in* those devout ascetics from the world, shut *out* malaria from them, and thus contributed to their

safety. That those peaceful retreats of devotion may be the more secluded, the walls enclosing them are usually lined with rows of trees, and sometimes of shrubbery. These have therefore added strength to the protecting barrier. I have no hesitation in believing, that a rampart thus composed, provided the wall be lofty enough, and the rows of trees sufficiently dense; and provided also that the entrances be kept closed, will arrest completely the progress of malaria, and afford protection to the residents within.

A knowledge of the exact distance from its source, to which malaria can travel, may aid much in the selection of secure situations for residence. But that knowledge is not now possesssed by any one; nor does it appear to be attainable in the present state of science. Well established facts seem to render it certain, that, under different circumstances, the poison travels different distances. It has been already observed, that it moves farther from its source with the wind than against it. And it may be added, that it

travels farther with a current of air, than through the calm atmosphere. Is the country level? The poison fills a wider sphere than if it were bounded by hills. For although it can attain the summit of a hill of considerable elevation, it is weakened by the journey, and rarely does much mischief on the opposite side. The distance it can pass along water is very limited. As already mentioned, it never reaches a ship lying cable's length from the shore. This has been satisfactorily ascertained in innumerable instances. During the prevalence of yellow fever in Philadelphia, families have taken refuge in vessels, anchored in the ship-channel, not more than from two hundred and fifty to three hundred paces from the wharves, and escaped disease. I doubt whether marsh miasm has ever passed over a river the fifth part of a mile in width. Unquestionably the inhabitants along one bank of such a stream are often healthy, while those on the other are suffering from bilious fever. Of a river not more than a hundred paces wide, I have

known the same to be true. Families residing immediately on the leeward brink of such a stream are often healthy, during the summer and autumn, while those on the same side, but a few hundred paces distant from the water, suffer from bilious fever. The reason of this is plain. The wind cannot convey the poison across the river to the former, while it removes from them that produced on the same side, and carries it to the latter. Nor is this all. Between the margin of the stream and the families living a short distance from it, there usually exists an interval of low ground, which is itself a laboratory of febrile malaria. This is also borne by the wind from the inhabitants resident on the water's edge, and thrown on those a little remote from it. Bilious miasm is said, by some writers, to travel from one to three miles, and by others as many leagues, from its source, and produce disease. The assertion wants proof. No authentic facts can be adduced in susport of it. I have never known an instance, in which malaria, even when

most abundant, produced fever more than half a mile from its source, perhaps not so much. I say, "when most abundant;" and certainly its amount must affect materially the distance it may reach. A large volume of it must be more diffusive than a small one, for the same reason that a gallon of wine, mixed with water, will give taste and flavour to a greater quantity of that fluid than a gill. In cases where malaria is believed to travel so far, intermediate sources of it are overlooked. I have already stated, and now repeat, that wherever there exists a bed of alluvial soil, or fertile soil of any kind, there the poison may be generated. And, in those instances, where it is supposed to travel so far, if a competent examination be made, such beds will be found between the most striking source of it, erroneously considered the only source in the case, and the extreme point to which it extends. It is exceedingly doubtful whether any wind can carry malaria a mile from its source, in a state of such concentration as to produce disease.

As relates to the means of ascertaining something of the mode and distance of the march of bilious malaria, the following facts may not, perhaps, be without value. Many years ago, the late Professor Wistar removed annually, with his family, to a summer residence, about half a mile, or perhaps a little more, in an eastern direction from the Schuylkill. Compared with the bed of the river, the ground he occupied was lofty. But several ravines, of considerable depth, ran from the edge of the stream toward his dwelling. None of them however reached it. Some of his neighbours, especially those between him and the river, were subject to intermitting fever. There was reason to believe, that the malaria productive of the disease came from the Schuylkill. While investigating the subject, the Professor discovered that the morning fogs, which arose from the river, without reaching the summit of the heights on either side, travelled along the ravines, to their termination, and then spread to given distances along the plain, in the

neighbourhood of their mouths. This leading to further inquiry, his next discovery was, that the sickness which prevailed, was confined almost entirely to the range of the fog. Those living without it were healthy, those within more or less diseased. Here, then, it would seem, that the limits of the malaria and the fog were the same; and that the latter, being visible, indicated the extent of the diffusion of the former. On the banks of the Ohio, the same is said to be true. Is it not probable, then, that, as a general rule, *habitual fogs* from marshy ground, may serve as a "cloud by day," to designate the places where human habitations may be safely erected? Let them be kept without the range of the visible exhalation, and they will be the more likely to be without that of the invisible. Where it is practicable to avoid it, dwellings ought not to be erected on alluvial ground, especially modern alluvion. Such a situation may, in time, be rendered healthy, but not without much labour and skill, accompanied probably by no little suffering.

When it is possible to avoid it, an alluvial situation should never be selected for the encampment of an army. Such a place has often produced sickness in a single night.

It was observed, in a former part of this Dissertation, that, in a district subject to bilious fever, night exposure is particularly hazardous. Is it equally so at all times of the night? I apprehend it is not. It is most dangerous during the descent of the dew; an event which occurs twice in the night; once, soon after sunset, and again a little before day-break. The hours at which this meteor falls, in different latitudes, and under different temperatures, are not the same. Observation alone can ascertain them, and enable those concerned to regulate their movements accordingly. Their safety consists in avoiding exposure during the fall of the dew. If their duty, therefore, calls them out at night, let them select the period between the times of the desent of that meteor. Another precaution of great moment, is to continue in action while in the

humid atmosphere. Exposure, at night, in a state of quietude, more especially in a sitting or lying posture, is full of peril, and should be strictly avoided. To fall asleep during the time is still worse.

Is any one wind more deleterious than another?—I mean, is it more heavily charged with pestilential miasm?—No; not in the abstract, and generally. If it is so, in any particular case, it is attributable to local causes. Much error, not to call it superstition, prevails on this subject, both in the minds of living physicians, and the writings of dead ones. The medical and poetic writers of Greece and Rome have said so much about the *humidus* and *pestifer auster*, that it almost makes a part of our professional creed, that the south wind is necessarily *moist* and *pestilential*. But nothing can be more destitute of truth. The Sirocco, which blights and kills from a lack of moisture, but has no pestilential taint in it, comes as frequently from the south as from any other quarter. And, in many places, the south wind is pecu-

liarly salubrious. Instead of being always, moreover, surcharged with humidity, it often beats back the haze and vapours that come from the north, and renders the atmosphere dry and serene. In Greece and Italy the south wind is humid, because it comes directly from the Mediterranean, bearing along with it much of the exhalation from that sea. It blows moreover during the hottest weather, when bilious and pestilential fevers most frequently prevail. Hence its supposed connexion with those complaints. But it is not the south wind, it is the high temperature of the atmosphere, that contributes to produce the febrile miasm. Let hot air stream in from any other quarter, as it does from the north, in the southern hemisphere, and the issue will be the same. Malaria will be produced. Wind derives its character, not from the point of the compass from which it comes, but from the nature and condition of the surface over which it passes. Is that surface moist? So is the wind. Is it dry? The wind answers to it. Hot?

The wind is also hot. Cold? Again the wind corresponds. And it carries malaria along with it, and may therefore be called pestilential, for a short distance after passing over a sickly morass. Such is the true philosophy of that meteor. On the Atlantic borders, in the United States, all winds from northeast to southwest, taking east in the semi-circle, are humid; and all in the opposite semi-circle, from southwest to northeast, are dry. The reason of this is obvious. The former come from the ocean, saturated with exhalation; and the latter arrive from the interior of the continent, exhausted of their humidity, by a long journey over land.

Dr. Lind speaks of a certain effect of the east wind, on the eastern coast of England, in terms which prove him to have been more of a mere observer, than of a philosopher. He says that this wind "raises a copious vapour from water, mud, and all marshy or damp places." And he insists that is does positively "raise" the vapour, and does not produce it in any other way; and that hence

that wind is peculiarly deleterious. An error grosser than this can scarcely be imagined. It is the counterpart of the belief, that the moisture, which, in a hot day, settles on the outside of a bottle or pitcher, filled with cold water, has passed through the pores of the vessel, in the character of sweat. Hence, by the uninformed, it is believed that the vessel actually does sweat. The east wind does not "raise" vapours, in the part of England referred to; it only renders visible those that are already raised. Coming immediately from the sea, it is cool and humid, and therefore robs the ascending exhalations of a portion of their caloric. The necessary effect of this is, to condense them immediately and render them visible. On the west coast of England the east wind acts differently. By passing over the island it has lost a portion of its humidity, and received in return a portion of caloric. It is not therefore a condenser of exhalation arising from water, and does not reduce it to a visible form. On that coast, the west wind, being more humid, is better fitted

to produce a vapour. It is on the same principle, I say, that a bottle, filled with any cold liquid, takes from the warm air in contact with it a portion of its matter of heat, condenses the humidity it contains in a state of vapour, and renders it visible in the form of water.

Is there any particular period of the moon's revolution around the earth, at which bilious fever more usually makes its attack, than at others? Yes; at the times of her full and change. This is neither "hypothesis," nor "vision;" although both terms have been affixed to it. It is a fact, as satisfactorily ascertained by observation, as any other connected with the complaint. The history of epidemic diseases, when circumstantially given, proves that attacks and deaths occur most numerously at the periods referred to. Some of the most distinguished members of our profession have recorded their observations to that effect. Were my own testimony of any weight, I would say that it fully concurs with that of others, who advocate the doctrine of

lunar influence. Nor is the reason of this concealed. The vicissitudes in the sensible qualities of the atmosphere, which are greatest and most frequent about the times of the full and change of the moon, act as the exciting cause of the complaint, in those who are already predisposed to it. Am I asked for the names of any of the writers, to whom I have referred, as high authority on this subject? I answer the demand, by mentioning Diemerbroek, Mead, Balfour, Mosely, and Rush. And I could add twice as many more, were it necessary. The prophylactic precept founded on this doctrine is plain, and not without its value. During the prevalence of an epidemic fever, let those who reside within the sphere of the malaria be especially cautious of exposure to the weather, about the periods of the full and change of the moon.*

*There is not, in the science of meteorology, a single fact that rests on a broader or more solid foundation, than that a great majority of the most sudden and striking changes which occur in the atmosphere, from heat to cold, and from moisture to dryness, and the reverse, and an equal majority of tornados, tempests, and other violent atmospherical

Are there any medicinal substances calculated to obviate the effects of malaria? I know of none. All nostrums administered for that purpose, are but the fruits of empiricism. Some physicians speak with confidence of the beneficial effects of repeated purgatives, in protecting the system from bilious fever. I consider the opinion unfound-

commotions occur about the periods of the full and change of the moon. This truth is supported alike by the records of the past, extending even to ancient times, and events that are constantly presenting themselves to our observation. That such vicissitudes in the atmosphere are uniformly prejudicial to the health of valetudinarians, is another fact which will not be controverted. But, during the prevalence of a bilious epidemic, every one exposed to the poison of it is so far valetudinary, as to be more than usually liable to disease. Exposure and unfriendly impressions of every kind, which would be innocent, at other times, produce sickness now. Such impressions are necessarily made by great and sudden changes in the sensible qualities of the atmosphere. It is on this ground that the atmospherical vicissitudes, occurring about the times of the full and change of the moon, act as exciting causes, and aid in producing new cases of the disease. Of all other epidemics the same is true, for the same reason. Hence, during the prevalence of every complaint of the kind, the same periods of the moon are most productive of fresh attacks.

ed, and the practice it recommends hazardous, not to say injurious. They are the growth of hypothesis. Sound science does not countenance them; and they derive no support from experience. Repeated purging, like the excess of any other evacuation, deranges the system, and enfeebles its conservative power. Instead of resisting, this invites disease. The alvine evacuations should be kept, as nearly as possible, in their state of habitual regularity. Change would be much more likely to prove injurious than useful. Medicinal substances are intended and suited, as their name imports, to restore health, when lost, not to sustain it when possessed. Let them be reserved therefore for actual indisposition, and then administered without loss of time, and with the skill and vigour required. Does constipation of the bowels occur? It threatens disease, if it is not the commencement of it, and should be promptly removed. But actual and continued diarrhœa, the result of the repeated administration of purgatives, is not the best

substitute for it. Too much purging is as bad as too little. Let both be avoided. *Ibis tutissimus medio*, is here the precept of experience and wisdom. In fine, I say of the functions generally of the alimentary canal and the organs connected with it, as I did of diet and drink; let them be maintained in the condition that has been found most favourable to health and strength. As far as they are concerned, this will afford the best protection from disease.

The use of bitters, Peruvian bark, and sundry other articles denominated tonics, has been recommended as a security against a prevailing bilious epidemic. This advice does not rest on any sound principle of Hygiene, with which I am acquainted; nor, as far as I am informed, does experience testify to the success of the practice it enjoins. I cannot therefore confide in its efficacy. By inducing an unnatural state of things, I apprehend it would be ultimately injurious.

A degree of cutaneous excitement somewhat preternatural, but not so high as to

amount to disease, would seem to promise some security from bilious complaints. Children affected with prickly-heat escape cholera infantum, unless, from a sudden change in the atmosphere, or some other cause, the eruption disappear. The same is true of adults, as relates to dysentery and bilious fever. Individuals who labour under elephantiasis are exempt from the fevers of hot climates; and the same is often the case with those who are troubled with cutaneous ulcers. Lazars of this description rarely suffer from oriental plague. Such, I say, are the facts; and the phylosophy of the cases must be sufficiently familiar to every physiologist.

What, then, would be the effect of preternatural excitement of the skin produced intentionally, as a means of prevention, during the prevalence of an epidemic fever?—of one or two issues, or small perpetual blisters, for example; or of the irritation produced by tartarized antimony? These expedients I have never tried to such an extent as to enable me to speak of the[illegible] from personal

observation. But some of them are recommended on high authority. I shall only add, that they tend to the maintenance of centrifugal action, which is well calculated to prevent disease. Under proper regulation, therefore, they may possibly be found worthy of more attention than they have heretofore received.

It was my intention to have expressed my opinion, with the grounds of it, on the subjects of the two following questions, which are remotely connected with some of those discussed in this Dissertation.

1. Does the same malaria produce typhus and common bilious fever?

2. Is the malaria productive of yellow fever the same with that which gives rise to intermittents and remittents; or is it a different form of miasm prepared from the same elements?

In each case my present views would induce me to give a negative answer. I consider the malaria of typhus different from that of bilious fever, in both its nature and

origin; nor, although formed from the same materials, do I believe the miasms of yellow and intermitting fevers to be identical. But as the consideration of these points is not essential to the solution of the questions proposed by the Faculty of Maryland; and as I have already trespassed on the limits I had prescribed to myself in this inquiry, as well, I fear, as on the indulgence of the Faculty, I decline further discussion, and close my Dissertation.

APPENDIX.

THE Dissertation, to which the following pages are appended, had been written a considerable time before I perused "McCulloch on Malaria." Had the case been otherwise, I would not have expressed myself as I have there done, respecting the writers who had preceded me on the subject. In a particular manner, I would not have admitted into the Dissertation the two following sentences. "Much indeed has been said and written *about* the malaria of bilious fever, but, as far as I am informed, very little directly *on* it"—"Seriously; as far as my inquiries have extended, the crude views, and indefinite expressions of writers on malaria, are incompatible with accurate information and practical results."

Of all I have ever read on the subject, Dr. McCulloch's "Essay" excepted, these sentiments are true. But of that work my report must be different. To condemn it would be

a sort of literary suicide; because it would amount to a condemnatory sentence on no small portion of my own Dissertation. On many leading points the coincidence of opinion in the two productions is striking. Were it not for this, and that therefore my praise of it might perhaps be regarded as self commendation, I would pronounce the "Essay" a publication of great merit. But as to speak thus of it might be deemed exceptionable in me, it is fortunately also unnecessary. The work will not suffer from my silence. It speaks for itself in terms that are convincing; and the medical profession will listen to it, be instructed by it, and do it justice.

I am not dissatisfied to find that Dr. McCulloch's opinion of preceding writers on malaria is the same as my own. On that point I was apprehensive that, should I even escape the charge of presumption, in supposing myself better informed than others, I would at least be considered unnecessarily censorious. Still I deemed it right to incur

the hazard, for the sake of representing things as they are, and thus aiding in the subversion of hypothesis and error, and the establishment of truth. It was therefore gratifying to me to meet, in the following passages, with the support of a writer so extensively versed in medical literature, especially on that subject, as Dr. McCulloch is. "As far as my reading extends, I have not found one luminous and philosophical view of the production and propagation of the poison (malaria) and little which can even serve the purpose of preventing diseases"—"It is far too common to find entire volumes (on the cause of bilious fever) filled with idle hypotheses, respecting pyrites, and volcanos and mines, and attributing to electricity, aurora borealis, magnetism, and similar visions, what the writers had forgotten to seek in that which ought to have been obvious to the most superficial and ignorant." p. 87.

Another topic, on which I was somewhat apprehensive of being considered an extravagant colourist, is the picture I have drawn of

the degeneracy of man, produced by malaria, in many of the sickly districts of Europe. But here again I am amply supported by the vivid and graphical representation of the same subject, by the same author. Indeed, although I well knew that truth would fully sanction the effort, I did not dare to paint as boldly and brightly as he has done, lest I might be supposed to be delineating the creations of a heated fancy, rather than the results of sober observation—recording what I had imagined or dreamt, not what I had seen. Hence my portrait falls short of truth, instead of exceeding it.

But, notwithstanding the merit of Dr. McCulloch's "Essay," it is not faultless in either manner or matter. I regret to add, far from it. A few pages excepted, which are composed with uncommon spirit and elegance, its style throughout is periphrastical, involved, and indefinite, in a degree rarely witnessed in any publication. Nor is this the worst. It is, in many passages, so obscure, as to render their meaning exceedingly doubtful.

Were it not that the author has proved himself capable of fine writing, it might be deemed hypercritical thus to censure his style, especially in a work devoted to science rather than letters. But no writer should be indulged in broad negligence. He is before the public, and, from respect to them, no less than to himself, ought not to appear in the character of a sloven. If he does not choose to be in full dress, he ought at least to put off his rags. Besides, a style strikingly faulty, especially if obscure, detracts not a little from the value of the work. It prevents it from being read with the same amount of either pleasure or benefit, that would be readily derived from it, were it suitably composed.

But, if I mistake not, there are, in the "Essay," other faults, which much more seriously concern the profession. As they relate to the subject of the foregoing Dissertation, a brief notice of a few of them will not, I trust, be deemed inadmissible. But as this appendix must not be protracted, my re-

marks on them can be but little more than hints.

As respects sundry points of which he treats, Dr. McCulloch appears to be inordinately influenced by *apprehension* and *credulity*. He fears and believes imaginary things, and earnestly discusses them, and admonishes with regard to them, as if they were realities. This renders him, as relates to such topics, an alarmist and an enthusiast, in a degree far beyond the warranty of facts. To be particular.

He has too deep a dread of *moisture*, as if it alone could generate malaria; although he expressly denies it that power. He would prohibit the formation of all fountains, basins, fish-ponds, lakes, canals, and other sorts of water-ornaments, in gardens, parks, and pleasure-grounds. His apprehension, as to such improvements, is a professional hydrophobia. He would shun, in warm weather, especially about eve-fall, the vicinity of a crystal rivulet, purling over pebbles and sand, and bedewing, with its light and glittering

spray, the verdure and blossoms on its banks, as if it were exhaling the poison of pestilence. Of the effects of every pool or other body of water, whether it be pure or foul, stagnant or in motion, and whether it cover miles, acres, roods, or inches, he entertains the same dread. Meadows he pronounces unhealthy, because the ground is not sufficiently dry. In fact, it would be scarcely extravagant to say, that he seems to regard water, in every form and condition, in which it can exist on the surface of the earth, as a nuisance during warm weather.

All this, I say, is extravagant and erroneous. Meadows, if properly drained and cultivated, are not unhealthy; but, if defectively prepared and unskilfully managed, they are so, in common with every other portion of fertile soil, suffered to lie in a similar condition. All experience testifies to the truth of this. Nor, if well constructed and carefully superintended, are either fountains, basins, lakes, or other ornamental forms of water, sources of malaria. It is the abuse of

them only that renders them so; and the abuse of the greatest good is productive of mischief. I could refer to hundreds of instances, in which such water-improvements have been, for many years, some of them for ages, familiarly approached and regularly frequented, both by night and day, without having produced, by malaria, a single case of disease. As relates to the formation of that poison, Dr. McCulloch and his countryman Dr. Ferguson are the antipodes of each other. The one flies for safety from *moisture*, and the other from *dryness;* and science sanctions the conduct of neither. Let ornamental bodies of water be surrounded by well cultivated grass-ground, and have their margins paved, gravelled, or pebbled, and lined with shrubbery and trees with branchy trunks, and they will produce no poison to injure those who may stray around them, admire their beauties, and enjoy their freshness, either by sun-light or moonlight. Let the borders of lakes, ponds, and pools be muddy, and strewed with vegetable mat-

ter running to dissolution, and they will soon become active laboratories of malaria; not otherwise. Were it true that this poison is formed, in warm weather, wherever there is moisture, and that so minute a portion of it as Dr. McCulloch pronounces sufficient, could produce disease, health would be a stranger to the human family. In summer and autumn disease would be acute; and chronic affections, in the form of our author's "ill health," would be a source of misery during the other portions of the year. If the Doctor will examine the matter a little more accurately, he will find that in nine cases out of ten, if not in nineteen out of twenty, this "ill health" or "indisposition," which prevails so extensively, and which he ascribes in every instance to the influence of malaria, is the product of indiscretion in diet and drink, or of excess or irregularity in the indulgence of the passions. In other words, it is the issue of some sort of intemperance, which is one of the most productive sources of bad health.

Our author's representation of this entire subject is eminently extravagant, and calculated to mislead. Who that has travelled through the western portion of the Union, especially the States of Ohio, Kentucky, and Tennessee, has not seen, in innumerable instances, large families in blooming health, with a pond to water their cattle during summer, and also for their geese to sport in, within a hundred paces of their dwellings, and often much less? I confess that when I first saw those sink-holes (for such many of them are) I considered them fertile sources of malaria. But my own observation, and the experience of others, the only correct instructors in such matters, soon convinced me of my error. And a brief examination unfolded to me the cause. The ponds have but very little alluvion around their edges, and contain no dissolving vegetable matter; or if they do, the water in contact with it is too abundant to favour the production of miasm, or it absorbs it when formed. Be this solution right or wrong, the fact is certain. The ponds are innocent.

The "Essay" pronounces "woods" unhealthy. I have already mentioned, and now repeat, that, in the United States, they are not so. Our forests when free from fens and marshes, are healthy. The "pine woods" of the south and west, as stated in another place, furnish secure asylums from malaria. This is probably owing to several causes. The surface of the ground is covered by very little vegetable matter; that which lies on it is chiefly resinous, and therefore not well suited to be dissolved and to produce miasm; and the soil being sandy imbibes and carries down the water that falls on it, together with any poison it may contain. In our common forests, it is only when the large timber and the underbush are removed, and the soil torn up by the plough, that malaria begins its reign. In a state of nature, those places are free from disease. Hence the vigorous health of our hunters, trappers, and other forest-rovers, notwithstanding their exposures, privations, and hardships.

It is well known that, in many large dis-

tricts, Italy is very sickly. But it is not, as a country, the terrific pest-house that Dr. McCulloch represents it. Nor is Sicily. Nor are the maritime and and fluvial regions of the continent of Europe generally. If they were, they would become deserts. So would all the islands of the Mediterranean, were they such haunts of malaria, as our author pronounces them. The inhabitants of those places, moreover, would have neither the robust bodies, nor the vigorous minds which they are known to possess. In his account of many of the districts referred to, the Doctor seems more of a poet than a historian. He addresses himself to the imagination rather than the judgment. I doubt not but he honestly believes what he states. But he is too credulous. He does not seem to understand the value of doubting, and has not therefore learnt the art. Hence he believes too much of what he hears and reads, especially if it harmonizes with his previous views.

One instance of his credulity is astonish-

tonishing. Holland is separated from England by the German Ocean, which is from a hundred to a hundred and fifty miles wide. Yet the Doctor asserts gravely that, in the spring, the east wind conveys malaria from the former country to the latter, and produces intermittents!! This neither needs comment, nor deserves opposition. Its own extravagance refutes it, and renders it innocent. No body will credit it. Malaria borne by the wind one hundred miles, along the surface of an agitated sea!! As soon shall it be brought from the seacoast of the moon! Have the crews of vessels cruising in the midst of the German Ocean ever been sickened by the east wind, in either spring, summer, or autumn? No; never. On the contrary, sickly vessels have often sailed from British ports, and become healthy by cruising in that body of water. They are even sent there occasionally for that purpose. But I need scarcely add, that the case would be otherwise, were they assailed by malaria from the coast of Holland. Nor are the Holland-

ers themselves always labouring under intermittents, when the poison of that disease is said to be carried from them to the English. Our author's plea that the *moisture* of the east wind qualifies it thus to convey malaria cannot avail him. From having swept across an extensive tract of interior country, that wind is *dry* when it leaves the coast of Holland, and becomes moist in its passage over the ocean. But the Doctor acknowledges that a dry wind is an unfit vehicle for the poison, because it has not the requisite affinity for it. The east wind therefore must leave Holland without it; and there are neither lakes, fens, nor marshes by the way, from which it can collect it.

Our author is mistaken in all his views, as to the distance to which malaria can be carried from its source, and produce disease, else that poison is not the same in Europe and the United States. I repeat what is stated in my Dissertation, that the space it travels over land, in this country, is short; and that over water much shorter. If the Doc-

tor will take the trouble to visit and carefully examine the places, where he contends that miasm produces fever a "league" or even a "mile" from its source, he will find intermediate repositories of dissolving vegetable matter, from which it arises.

Dr. McCulloch does not appear to have correct views of the general philosophy of the diseases produced by the malaria of the Nile. Plague is incontestibly one of them, although he does not think so. That terror and scourge of the Old world is nothing but a modification of the yellow fever of the New; and neither disease is contagious. Nor can the miasm of either adhere to clothes, merchandise, or any other solid substance, and be separated from them again, and still retain its virulence. It cannot therefore be conveyed in ships or caravans, from one country to another, and there communicate disease. A belief that bilious malaria can thus attach itself, and still maintain its febrific power, from year to year, constitutes another of the errors of our author. The

notion is not sustained by a single fact, and is therefore entitled to no credit.

The opinion that plague and yellow fever are but different forms of the same disease, rests on evidence which must command ultimately universal assent. Some of it is to the following effect. In all leading and essential points the two complaints are precisely alike. They prevail in similar situations, during the same season of the year, and under the same degrees of atmospherical heat. In their rise, progress, decline, and termination they are identical. They spread only in an atmosphere replete with malaria, produced by the dissolution of organic matter. In other words, they are necessarily associated with a want of cleanliness. They attack most readily and most certainly destroy the same descriptions of persons. When cases of either of them are removed beyond the sphere of a miasmatous atmosphere, they never communicate disease to the attendants of the sick. Palpably, therefore, I repeat, they are not conta-

gious;* nor can the poison which produces them subsist from one year to another. It is, in every case, a fresh production of the place and period of its prevalence. There exists between them sundry other points of resemblance, which I forbear to mention.

Shall I be told that these two diseases differ so widely in their fundamental symptoms, that they cannot be the same? That plague is characterized essentially by buboes and carbuncles, and yellow fever by black vomit and a jaundiced skin? I reply that this objection has no weight. Neither are buboes and carbuncles essential to plague,

*The opinion that the plague is not contagious, the author has maintained since an early period in his medical studies. He asserted it in the year 1801, in an oration delivered before the Philadelphia Medical Society, and published by that body. For aught he then knew or yet knows to the contrary, he at that time stood alone in the belief, which was pronounced exceedingly wild and visionary. All he has since learnt respecting it has only served to convince him that it is true. Nor is he now solitary in the opinion. He is supported in it by several distinguished physicians, with whom it is honorable to concur. He feels persuaded that time will render the belief universal.

nor a yellowness of the skin or black vomit to yellow fever. In the most malignant and suddenly fatal cases of plague the former symptoms do not appear, nor do the latter in the worst cases of yellow fever. To every one competently informed on the subject, this fact is familiar. Of the slightest forms of the two complaints the same is true. They are not marked, in the one case, by buboes or carbuncles, nor, in the other, by black vomit or a yellow skin. Those symptoms, therefore, are not fundamental. The diseases can exist without them. It is only under certain grades of violence that they are marked by them. Nor is this all. In some cases of plague a dark discharge from the stomach and a yellowness of the skin have been observed. And that glandular swellings and carbuncular sores exist occasionally in yellow fever, is well known to American physicians conversant with the complaint. In what are *truly* their fundamental symptoms the two diseases *are* alike. Their *seat* and *pathology* are the same, as

appears from accurate *post mortem* inspection. The abdominal viscera constitute the former; and the latter consists in a deep congestion of some of those organs, the result of irritation by the miasm of the complaints. Their symptoms, therefore, really fundamental, are the usual manifestations of great chylopoetic derangement. I mean derangement of the chylopoetic system. Hence I feel justified in asserting, that in every thing essential the diseases are identical.

Dr. McCulloch is inclined to believe, that, in ancient times, when Rome contained her millions, and the surrounding country was densely populated, that part of Italy was as sickly as it is at present. This hypothesis is highly improbable, not to pronounce it necessarily unfounded. The existence of a power which governed the world was incompatible with such a state of things. Pestilence alone would have been fatal to it. The crowded population which once covered the Pontine marshes, the Campagna di Roma, and other portions of the surrounding coun-

try, could no more exist there now, than it could in the mangrove swamps of the Congo, or among the lagunes and jungles of the Ganges. The soil of that district of Italy must have been much more thorougly cultivated in ancient times than it is at present, else it could not have afforded subsistence to its numerous inhabitants. Virgil, moreover, testifies, in his Georgics, that, in his day, Italian agriculture was in high condition. And that was a preventive of the formation of malaria. Compared to its present state, therefore, Italy must have been healthy.

Our author attributes much of the sickliness of modern Italy, and of other maritime and fluvial districts, to the constant augmentation of alluvion along the banks and at the mouths of rivers and smaller streams. This is certainly, at the present time, a source of disease; but not necessarily of so much as the Doctor ascribes to it. It is doubtful whether it is *necessarily* the source of any. Indolence and neglect are indirectly the cause of the mischief. Let an enlightened

cultivation of the soil keep pace with the progress of alluvial deposition, and the evil will be greatly diminished, if not entirely prevented. Land rescued from the water by art differs but little, in many instances, from alluvion. Virtually it does not differ at all. Yet it is well known that, by proper means skilfully applied, that can be prevented from producing sickness. Meadows thus formed and managed produce no disease; and even Venice was once a place of health. As mankind advance in knowledge and wisdom, and attain the requisite government of themselves, as individuals and in communities, they will learn to apply to their own benefit the good gifts of nature. The rich alluvion that rivers are daily forming is one of these. Instead therefore of suffering it to depopulate countries, by the production of malaria, industry and enterprise will convert it, by suitable modes and degrees of agriculture, into healthful abodes and fertile fields, for the accommodation and maintenance of the human race, under their steady

increase in number. Even in our own country, the alluvial tracts that were formed centuries ago, and are still covered annually, some of them perpetually, by the waters of the Mississippi, will support hereafter the population of an empire.

As to the apprehension expressed in the "Essay," that Rome will be depopulated, and reduced to the desolation of Babylon, by malaria, I consider it unfounded. Or, should it be realized, man will be in fault. I should rather perhaps say, that the Papal government will be in fault. Let that tyranny be overthrown, or so mitigated that the Italians may feel that they are labouring for themselves, and not for inexorable and rapacious task-masters, and their beautiful country will soon put on a new aspect, and rise, in all respects, to a new condition. Her fields will become as fresh and pure in verdure, as her skies are in azure. Her inhabitants will be no longer enervated by sloth, and broken in body and spirit by poverty, nor her balmy breezes tainted with poison; and

the healthfulness of ancient times will revisit her. The country being thus improved, add to each town and city a wise and energetic police, and the work will be complete. Of every other place where sickness is increasing from the same cause the same may be said. Agriculture, skilfully pursued, and cleanliness, strictly maintained, are competent to arrest the mischief and restore health.

Dr. McCulloch asserts that close, narrow, small, crowded, and of course dirty streets and houses, where the poor reside, are better calculated to resist the progress and prevent the bad effects of malaria, than wide streets, lined with the large and airy dwellings of the rich. He points to Rome in verification of the fact, and then attempts to assign the cause of it. He seems to think that the febrific poison is, in some way, neutralized in such places. I shall only reply, that things are otherwise in the United States; and that I cannot perceive any correctness or feel any force in our author's reasoning. When any form of bilious disease prevails in the large

cities of this country, the poor are the earliest and the principal sufferers; and the narrower and filthier the streets, and the smaller and more crowded their houses, the more certainly are they attacked, and the more formidable are their complaints. To this I have never witnessed an exception; nor do I remember to have read of one, until I opened the "Essay." I know that, at times, some forms of epidemics attack certain classes of the community, in preference to others. But both observation and reading have taught me to believe, that bilious complaints always visit first and most fatally the abodes of poverty.

In Dr. McCulloch's preventive measures there is nothing new; nor, in prescribing them, does he appear to have been always under the direction of sound physiological principles. Some of them are not only useless but injurious. The Doctor recommends the kindling of fires, as a means of *dissipating* or *destroying* malaria, and thus protecting those who would be otherwise exposed

to it from its deleterious effects. He alleges that the smoke and heat co-operate in their prophylactic agency.

That fires may be rendered useful cannot be doubted; but not on our author's principle; not by acting on the malaria so much as on the human system. By preserving the proper temperature around the surface of the body, they maintain the vigour and secretions of the skin, sustain centrifugal action, which is that of health, and thus enable the powers of life to resist the assault of the miasm. They counteract, moreover, the influence of atmospherical moisture, which might otherwise prove an exciting cause of disease. But they do not and cannot so dissipate or destroy malaria, as to prevent it from coming into contact with those who are around them. Their necessary effect is to create a conflux of air from every point toward themselves. The air, thus flowing from the circumference of the circle to the fire in its centre, and bringing malaria along with it, must inevitably precipitate that poison on

those who are in the vicinity of the fire, before it can be materially affected by the heat. On this ground it might even be suspected to do harm rather than good. That they might act on Dr. McCulloch's principle, the fires should be so arranged as to form the circumference of the circle, and those to be protected from miasm by them occupy the centre. Then indeed the enemy might be scorched, in the fiery ordeal, before reaching its object. But are matters ever so managed? No; never. Nor does our author so direct them. Fires kindled in the streets and elsewhere, on an extensive scale, with a view to dissipate or destroy the malaria of the great plague of London, are said to have done mischief. Be this as it may, I have certainly seen fires kindled through the streets of a city, to protect the inhabitants against the poison of yellow fever, and strongly odorous matters consumed in them, without doing any good. Indeed to think of purifying, by all the fires that can be kindled and kept burning, the entire atmosphere of a city or

tract of country from the malaria, constantly pouring into it from innumerable sources, is visionary. The cause is too limited and feeble for the effect contemplated. When those who are exposed to bilious miasm, therefore, so employ fires as to keep their persons comfortable, and their dwellings, especially their bed-chambers dry, they have nothing further to expect from them. As respects certain other protecting agents, the Doctor expresses himself as follows.

"The other class of preventive remedies comprises modes of exciting the animal powers by food, spirituous liquors, and so on, or of diminishing the sensibility by narcotics, such as tobacco and opium. Of the utility of these expedients, the experience is ample."

If by "exciting the animal powers by food," our author means maintaining health in perfect vigour and firmness, by aliment found by experience to be salutary, I concur with him; not otherwise. All excitement beyond this, whether by food, condiments, or drink, tends to exhaust and debilitate the "animal

powers," and is pernicious. In other words, it weakens the conservative energies of the system, in common with every sort of excess. Of "spirituous liquors," as a means of prevention, I have expressed my opinion in my Dissertation, and am not inclined to retract or alter it. In the *abstract* they are injurious. Other things being alike, persons who have never used them are more likely to escape bilious fever than those who have; and, should they be attacked by it, their suffering will be lighter, and their recovery more probable. But, as I have elsewhere stated, it is hazardous for those who have been long accustomed to the moderate use of spirituous drinks, to abandon them suddenly, because they are exposed to bilious malaria. To take them in larger quantities, as a prophylactic measure, is worse. Health is best secured by making no change. Of wine the same is true. Abstractedly considered, its use is no means of safety. To wash the skin with it and distilled liquors would be much more beneficial than to drink them.

Officers are more healthy than privates, not because, as our author alleges, they *drink more wine*, but because they are more regular in their general habits, and also less exposed. They are likewise more cleanly and more suitably clothed. In plain language, they take better care of themselves, know better how to do it, and are better provided for the purpose. Those, however, who have been accustomed to the temperate use of wine, and have enjoyed good health under it, ought not to relinquish it, on account of the occurrence of a bilious epidemic. As to "tobacco and opium," I do not believe that they ever acted as a safeguard against bilious malaria, in a single instance, or that they ever will. In that respect, neither science nor experience attests their usefulness. Opium-eaters are said to be as liable to plague as other persons; and, as respects yellow fever, I know this to be the case with the votaries of tobacco. They suffer from that complaint no less certainly than the rest of the community. Nor does the Frenchman's

snuff, or the offensive smoke of the Hollander's pipe protect either of them from the bilious diseases of his country. Confidence in such nostrums is discreditable to physicians, and injurious to those who rely on them for safety. Of the practice of applying a handkerchief or the corner of a cloak to the mouth and nose, and covering the head by a veil or *canopeum* of gauze, as means of protection, in a malarious atmosphere, our author speaks *doubtingly*, but is evidently inclined to consider it useful. Here agian I am compelled to differ from him, and to pronounce such expedients no better than quackery. They are to be classed with the employment, for the same purpose, of volatile salts, the "commander's balsam," the "vinegar of the four thieves," bags of camphor and saffron tied to the scrobiculus cordis, coughing and spitting while in sick-rooms, and washing the hands, face, and mouth, immediately on coming out of them, with all other charms and amulets, which superstition confides in, reason laughs at, and experience rejects. I

have seen them all tried to no purpose; individuals without them escaping as well as those employing them; perhaps better. *Timidity* is the usual accompaniment of their adoption; possibly it is in no small degree the cause; and that, by debilitating the system, invites disease. Next to a removal beyond the reach of malaria, fearlessness, temperance, regularity, and prudence, are the best safeguards.

For a practical man, Dr. McCulloch has too strong a predilection for things bordering on the marvellous. I mean that he speculates too much on certain future and very remote and doubtful contingencies, not to apply to them a less respectful term, which the human mind can scarcely grasp. One of these is the reduction of the surface of the earth to a level, by the disintegration of all mountains and hills, and their being washed by rains and dissolving snows into the seas, valleys, and low-lands generally! When this event shall have occurred, the amount of alluvion is to be terrific, that of malaria in pro-

portion, and the prevalence of sickness in proportion to each. In direct terms, man and all other animals inhabiting mountains, hills, and plains are to be extinct, the earth to be a huge quagmire, and peopled only by crocodiles, alligators, frogs, and turtles, and such other foul and misshaped beings as subsist in water and delight in mud!!

Another of these wonderful doings is to be the draining of lake Erie, and, of course, in time, of all the other lakes connected with it, by the travelling of the Falls of Niagara up stream, cutting a channel for themselves through all obstructing matter, until they shall have reached the extreme point of the lake of the Woods, or whatever other lake of the entire chain is most remote!! Then there is to be terrible havock on our north-west borders, by the malaria issuing from the basins of the lakes, thus deserted by their waters, and converted into sinks of festering alluvion! Compared to this new manufactory of poison, the marshes of Italy, France, and Holland will be but so many Montpel-

liers! Lake Superior alone will exceed them all in magnitude and mischief, as far as the *Palaiotherium incognitum*, whose bones have been recently discovered, surpassed in size the elk or the buffalo, which he swallowed at a mouthful! How far this atmosphere of lake-poison is to be carried by the wind, our author has not informed us. But, according to some of his other computations, the distance must be prodigious; in one direction, at least to the Gulf of Mexico; in another, to the Rocky mountains; in a third, to Hudson's Bay, if not to the North Pole; and, in a fourth, to England, Russia, "or the Lord knows where!" Nor has he told us, whether the levelling of the earth, or the draining of the lakes is to occur first; or whether they are to be contemporary events. Respecting the precise epoch of the catastrophes, whether before or after the millennium, he has left us equally in the dark. He has not even given us to understand, which could perform its journey in the shortest time, a sloth to the moon, the

mountains to the sea, or the Falls of Niagara to the furthest end of the lake of the Woods! Nor has he favoured us with his opinion, whether, by the time of these wonderful occurrences, man may not, to be prepared to meet them, have made such wonderful advances in knowledge, as to be able, by some preparation of "tobacco or opium," to render himself poison-proof! On all these momentous topics he has left us to the indulgence of our dreams and fancies, because perhaps he has the charity to consider them as good as his own.

Seriously; such speculations in such a book as the "Essay" by Dr. McCulloch, are grieviously out of place.* They tend to

*It is not unknown to me, that, in the opinion of many, there is a seeming probability in the speculations of our author, respecting the washing down of the mountains and hills, and the draining of lake Erie by the Falls of Niagara. From the highlands, say those individuals, a certain amount of matter is daily conveyed, by currents of water, into the low. Hence, in the lapse of time, including perhaps many myriads of centuries, the former must be reduced to a level with the latter. Again, say our calculators; the Falls of Niagara have already travelled up stream

give a temporary reality to visions of the kind, and thus to divert the attention of readers from substance to shadow. Should a second edition of the work be called for, as I doubt not will be the case, they ought to

eight or nine miles, and are now, every moment, washing particles from the edge and front of the precipice, over which the water tumbles. Within a period of time, therefore, short of infinite duration, they must arrive at the mouth of lake Erie, make a breach in its bank, and liberate its waters.

All this, while viewed as a mere abstraction, looks well enough. So does the enigma of the infinite divisibility of matter. But let an attempt be made to regard either proposition as a practical truth, and it becomes an absurdity—certainly it turns to a thing incomprehensible. The calculator who endeavors to fathom it is immediately lost in the abyss of infinitesimals. Besides; admit the infinite divisbility of matter or space, according to the common interpretation of the phrase, and it may be contended with great plausibility, if not reduced to a demonstrated truth, that the moon may be compressed into a lady's thimble, and that the sun is no farther from the earth, than Washington is from Baltimore. But this is mere badinage. For boys to amuse themselves and sharpen their wits, by attempting the solution of philosophical conundrums, may be allowable. But when men are writing books, to instruct the world on sober and important subjects, it is unbecoming in them to concern with toys or puzzles.

be withheld from it, in common with several other like disquisitions, in which the author has indulged himself. They resemble too much the empty notions of Captain Basil Hall, about the filling up of the basin of the Gulf of Mexico, and its conversion into dry land, by the alluvial depositions from the waters of the Mississippi. In the pages of a publication treating of grave and important matters, they are as incongruous as a pun in a funeral sermon.

Am I asked, what there is in Dr. McCulloch's "Essay" worthy of praise, seeing I have found so much in it to censure? I answer, that there is an abundance in it to be praised; much more than I have either space or leisure to specify. Let the reader examine it for himself, and he will not only find this true, but will be amply rewarded for the time spent and the trouble incurred in performing the task. Added to the many important truths which the work itself contains, it will do much good, by inducing physicians to bestow more attention on the subject of mala-

ria than they have heretofore done. On the same ground the present project of the Medical and Surgical Faculty of Maryland will be eminently useful. It will do much toward procuring for the poison in question a thorough investigation. Were the Legislatures of the several States to institute inquiries respecting the malaria of bilious fever, in all its relations, and invite physicians to communicate the result of their observations in reply, the issue would be in time an invaluable accumulation of knowledge, on a matter of infinite moment to the public welfare, accompanied by an amelioration of the condition of our country, which no human foresight can compute. Nor would the benefit of the measure be limited to our own country; the civilized world would partake of it.

To conclude; although the perusal of Dr. McCulloch's work has both gratified and instructed me, it has not induced me to alter a single view, or surrender a single principle, previously laid down in the body of my Dissertation. On the contrary, by the able sup-

port it has given to many of them, it has strengthened my confidence in their correctness, and rendered my adherence to them the more firm. In its original condition and dress, therefore, that production and its appendix are respectfully submitted to the judgment of the Faculty.

THOUGHTS ON TEMPERAMENT.

WHEN an accurate observer enters an assembly of human beings, or even looks on a collection of inferior animals, that which perhaps first and most forcibly arrests his attention, is the striking difference he discovers between beings of the same race. If he be possessed of a contemplative character, and strongly inclined to the study of relations, this would necessarily be the case, did not the familiarity of the phenomenon take from it some portion of its impressiveness. So extensive and multifarious is this difference, that no two individuals can be found, who, on a strict examination, prove exactly alike. In but very few instances are they even nearly so. Were the whole of mankind that are now living collected together, and could the countless myriads of the dead, clothed in their former appearance, and possessed of all their attributes of life, be called up and intermingled with them, it is doubtful wheth-

er there would be two persons in the mighty crowd, that might not be easily distinguished from each other. We have even strong ground for believing that there would not be. Nor is this dissimilitude confined to any one or even to all of the external and visible properties. It pervades the entire being, comprehending every kind of manifestation corporeal and mental. It includes looks, gestures, modes of expression, sound of the voice, manner of standing and moving, amount of muscular and of adipose substance, condition of many individual functions, proportion of solids to fluids and of the hard parts of the body to the soft, degrees of irritability and sensibility, likes and dislikes of both animate and inanimate objects, technically termed sympathies and antipathies, fashion, facility, and vigour of thought with their external indications, and every thing else that can either constitute or vary character. Nor is it in the animal kingdom alone that this interminable diversity is observable. Vegetables also partake of it; not indeed so

strinkingly, but in a perceptible degree. Let the forest be examined with the requisite attention, and no two trees of the same species will be found in it exactly alike in their external marks. Examine them internally, and the difference there will be equally obvious; in many cases more so. Let the scrutiny be extended to all other forms of vegetable production, and, in relation to them, the same will prove true. No two of them will be precisely alike, either externally or internally. So boundless is the variety, which the observation of all time has discovered in the character of living matter. And the record of it is every where to be found in the *written*, and its recognition in the *traditionary* history of human knowledge.

But man is as prone to reason as to observe; to look into causes, as to notice effects. Hence the cause of this diversity, especially as relates to the human race, has been long a subject of eager inquiry. At what particular period this investigation began, no existing records inform us. But it can be regu-

larly traced, through those of medicine, to the time of Hippocrates. Not only was that great observer sensible of the diversity in mankind that has been referred to; he endeavoured to account for it. Yet speculations of that description do not appear to have been as attractive to him, as to many others who have flourished in our profession. His mind was not of a cast to be deeply engrossed by them. His writings testify, that he delighted in a knowledge of facts and events, rather than of their relations, and that he was more attentive to the study of the former than to that of the latter. In other words, he observed more than he theorized. Hence he did not embark in the investigation just specified with the fervid zeal of some of his successors. To a certain extent, however, he did embark in it, and, in pursuing it, indulged more in fancy and hypothesis, than he has done perhaps on any other subject. He had evidently no correct knowledge of the structure and economy of the human body. He was not acquainted even

with the principal organs of the system, much less with their functions. He considered the body as composed of four humours, *blood*, *phlegm*, *common bile*, and *atrabile* or *black bile*. Of these, the blood was essentially *hot*, the phlegm *moist*, the common bile *dry*, and the black bile *cold*. The usual reading of this hypothesis is, that the blood is hot and moist, the phlegm cold and moist, the yellow bile hot and dry, and the black bile cold and dry. Such were also, in his opinion, the ruling qualities of the four seasons of the year. Between the seasons and the humours, therefore, there was so strong an affinity, or rather sympathy, that the former exercised a predominant influence over the latter, and tended to augment them in quantity, in conformity to that sympathy, during the time of their own prevalence. The spring, in consequence of its kindred qualities, augmented the blood, the summer the common bile, the autumn the black bile, and the winter the phlegm. Nor did they add only to the quantity of the humours; they

heightened also their qualities, and thus imparted more strength to the nature of each.

These humours were the source of temperament. According to the predominance of one or more of them, was the temperament of the individual, in whom the predominance occurred. Did the blood superabound? The temperament was hot. Common bile? It was dry. Black bile? It was cold. Phlegm? It was moist. But as the seasons of the year regulated each its kindred humour, the temperament changed, if not entirely, at least in part with every change of season. Hence the sanguineous temperament prevailed in spring, the bilious in summer, the atrabilious in autumn, and the phlegmatic in winter. There were therefore four *simple* temperaments, out of which were formed certain *compound* ones, by the mixture of different portions of the humours, and the joint predominance of some two of them. Such appears to have been the hypothesis of Hippocrates on the subject of temperament; and it is abundantly visionary. Yet, as al-

ready mentioned, he was much less imaginative than many physicians of distinction who flourished at subsequent periods.

This is true, more especially in reference to Galen, who possessed a mind in a great measure the reverse of that of his master. He was the prince of theorists, and one of the ablest and most fascinating speculators in science, that has ever shed a lustre on any profession. In his estimation, facts, without a knowledge of their causes, and some view of their own operation and effects, had comparatively but little value. He no sooner, therefore, discovered the universality and multifarious nature of the diversity, that marks the aspect and character of the human family, than he commenced an ardent inquiry into its causes. And to the theory which he formed, for the explanation of the phenomenon, is the whole subject indebted for the name he bestowed on it, in his native tongue, and which, translated into other languages, it still retains. In common with preceding and contemporary philosophers, he believed

in the natural and permanent attachment of certain different and specific properties to the different fundamental elements of matter. These properties, which were *heat*, *cold*, *moisture*, and *dryness*, were in themselves radical, and one or another of them belonged to every kind and particle of matter, and gave it character. The elements of matter thus endowed, entering into the composition of living bodies, were *mixed* together; and the *mixture* formed by them derived its character from the relative proportions it received and retained of the different fundamental particles, each kind bringing along with it its specific property. The character of the compound, therefore, depended on the predominance in it of one or more sorts of matter over the others. Did the elements possessing *heat* superabound? The nature of the mixture or composition was *hot*. Did those possessed of *cold* superabound? Its nature was *cold*. Its *dryness* and *moisture* depended, in like manner, on a predominance of their kindred particles. Were the

elements so proportioned that there was no predominance of one sort of them over another? The mixture was perfect, its fundamental properties balancing each other, and preventing any constitutional tendency to disease. I allude here to the human body, whose native predispositions, whether morbid or sound, were supposed to depend on its original composition. When this composition was such, that the primitive elements, with their properties of *heat*, *cold*, *moisture*, and *dryness* maintained in it, in relation to each other, an exact equilibrium, the constitution of the individual, for the maintenance of health, was as perfect as it could be made. Of course the liability to disease was in proportion to the deviation from this balanced condition.

Persuaded of the correctness of these views, Galen bestowed on the entire subject the Greek name of *krasis*. This word may be rendered in Latin *temperamentum*, which, turned into English, is *mixture*. We, therefore, in this instance, deriving our nomencla-

ture from the Latin, instead of the Greek, retain the technical term *temperament*, and still designate by it, as its author did, the marked differences in the aspects and characters of men, to which reference has been already made. Nor is this the case with English and American physicians only. The same word, so modified as to suit the genius of each different language into which it has been translated, or one of similar import, is used to indicate the same subject, by all modern writers in medicine. Hence the influence of the theory of Galen has descended, through his followers, to the present time, and is probably destined to be as lasting as the profession he adorned. So deep and indelible is the impress of genius, aided by industry, ambition and attainment, on the mind of mankind.

Intrepid as he was in thought, and endowed with an ardent and creative imagination, that great physician found no difficuly in applying his doctrine to the human body. Somewhat in conformity to the views of

Hippocrates, he pronounced the blood to be *hot* and *moist*, the *yellow bile hot* and *dry*, the *lymph* or *phlegm cold* and *moist*, and the *melancholic* or *black bile cold* and *dry*. Corresponding to these four humours, he discovered, or rather *imagined* an equal number of temperaments; the *sanguineous*, which, because the blood predominated in it, was hot and moist; the *bilious*, which, from a predominance of yellow bile, was hot and dry; the *pituitary* or *phlegmatic*, which a superabundance of phlegm rendered cold and moist; and the *melancholic*, which, through a redundancy of black bile, was cold and dry. Thus did the character of the temperament depend on the predominance of one or more of these fluids, the latter condition rendering the case more complex. And according to the degree of predominance was the strength of the temperament, and the liability of the possessor of it to certain kindred complaints. To the sanguineous temperant strongly developed, belonged diseases accounted *purely inflamma-*

tory, such as pleurisy, peripneumony, and rheumatism; to the bilious, fevers marked by a *redundance of bile*; and to the pituitary, complaints of *defluxion* and *obstruction*, with *eruptions on the skin*. This class included dropsy, scrophula, and other diseases of an indolent character. The complaints allied to the melancholic temperament were chiefly mental and nervous. Hypochondriasis and melancholy madness were the most formidable of them. But fevers occurring in melancholic constitutions were also peculiarly modified by the temperament.

Out of these four primary temperaments Galen formed an equal number of secondary or compound ones, in each of which two of the humours predominated over the others. Add another, making the ninth, in which the humours were in a state of equilibrium, and his system is complete. Each temperament, moreover, was said to be associated with certain personal appearances and attributes of mind, which clearly designated it, and distinguished it from the others.

On details of this description, however, I must not dilate. The limits within which it is my purpose to confine this article forbid it. Much less do they permit me to give a synopsis of the theories of Stahl, Haller, Cabanis, Richerand, Halle, and other writers on the subject I am considering. Nor, although the preceding notions, some of which still find advocates among physicians of standing, are, as already mentioned, highly visionary, and many inferences deduced from them plainly injurious, shall I consume time in a formal refutation of them. If the views I shall exhibit hereafter be true, the prevailing doctrines on the subject of temperament are unfounded; and on that form of opposition to them shall I chiefly rely.

Before proceeding further, however, it is not only requisite, as relates to certain ends I have in view, but is also a tribute to truth, which I may not withhold, to observe, that the whole hypothesis of Hippocrates, in common with that of Galen, is the growth of humoralism. And what is humoralism? I

reply, one of the most fearful and destructive monuments of error that has ever been erected. True science disavows it, and humanity has wept for ages over the desolation it has produced. It is a professional Idol, which, throughout the many centuries of its existence, has done nothing but falsify and adulterate the principles and lamentably pervert the practice of medicine. Under the fatal spell it has thrown over them, physicians have not only worshiped it in sentiment, but sacrificed to it millions of their fellow beings. This assertion is neither visionary nor extravagant. Were there leisure to dwell on it, and were the occasion a suitable one to do so, the charge could be substantiated by volumes of facts.

The solids of the body make man what he is. They, of course, form the fluids, and give them their character. Nor do they, in health, receive any more of real character from them, except as the result of their own action, than they do from the vapour that rises or the dews that fall. The solids are the cause, the fluids the effect: the former the

tree, the latter its fruit. When, therefore, the order of things shall be so reversed, that the cause shall be subordinate to the effect it produces, and the tree to the fruit that grows on it, then may it be admissible to allege, that, by some unprecedented mode of operation, the human fluids bestow character on the human body; not before. The hypothesis is at war with every principle of sound physiology; and, worst of all, it is at war with common sense. As well may it be contended that the mountain receives its form and character, and produces all its effects, from the torrent that dashes over its cliffs, or the placid stream that washes its base, as that the human system does from the fluids it contains. And as many useful inferences could be drawn from the one notion as from the other; but not so many pernicious ones. True; when the blood and the other humours are formed, they are not without their influence. But that influence, whether for good or evil, is fairly attributable to the solids that produced them and gave them their

qualities. If the solids are sound, so will be their product; and the reverse. All disease therefore begins in the solids. I might add, that it *virtually continues* in them, and is not correctly predicable of the fluids. Blood, chyle, lymph, bile, and other humours, can be *vitiated* in their condition, but not *diseased*, in the common meaning of the word, or according to any legitimate interpretation of it. If there be a seeming exception to this in favour of the blood, it is *only* seeming, and not real, as might be readily made appear by a fair discussion of the subject. The term *disease* relates as exclusively to the solids, as the terms *sensibility* and *secretory action* do. Besides, however deeply vitiated the condition of the fluids may be, under abnormal action in the parts which prepare them, let soundness be restored to the functions of the solids, and that vitiation will soon be removed. So absolute is the control of the latter over the former.

Having, without reserve, passed the preceding strictures on the views of others, re-

specting the cause of temperament, it will probably be expected of me, that I present my own with equal frankness. The expectation, if entertained, is reasonable, and must not be disregarded. I shall therefore enter on the task, asking of my readers nothing more, than to receive my opinions, with such matter as may be offered in illustration and support of them, for as much as they may be worth. But I must beg to be indulged previously in a brief explanation.

At the commencement of my lectures on the Institutes of medicine, in Transylvania University, in 1819, and for a few years afterwards, I expounded to my classes, with considerable modifications and additions of my own, the prevalent doctrines on the subject of temperament. But I was far from being satisfied with the views I communicated, and freely expressed myself to that effect. I did not therefore actually *teach* the doctrines, because I considered them fundamentally erroneous. My lectures on them bore the character of an analytical and condemnatory criti-

cism, rather than of an exposition unfolding and maintaining their truth and recommending their adoption. I contended then, as I do now, that the solids, being the controling portion of all living organized matter, must be looked to exclusively as the ground of temperament. In this state of dissatisfaction with my teaching, I persevered in my inquiries, with a view to its improvement, and made, from time to time, material alterations in it. I felt myself approaching what was more satisfactory to me, because it appeared to be more consistent with the principles and laws of the animal economy. But it was not until my course of lectures delivered during the winter of 1825-6, that I fonud myself prepared to communicate to my class a portion of the views which I now entertain on the subject. Since that period I have inculcated them regularly, making annual additions to them, and endeavoured to illustrate and sustain them by such facts and arguments as appeared most pertinent, some of which will be embodied in this essay.

This narrative is intended as a vindication of my claim to opinions which are my own; and I am induced to offer it for the following reason. My views on the subject of temperament bear a striking resemblance to those of Dr. Thomas, as exhibited in a volume of great interest, entitled "Physiologie des Temparamens ou constitutions," published by him, in Paris, in 1826. I do not not deny that I have even somewhat modified them, in conformity to the principles so happily stated and so ably defended by that distinguished writer. But I did not derive them from him. They were mine at least a year before the appearance of his work, and upwards of two years before I was apprized of its existence. The volume itself I have never seen; nor do I believe that it has yet reached the United States.* I am indebted for all my knowledge of it to a brief analysis of it, contained in Nos. XV and XVI of the Edinburgh Phrenological Journal, prin-

*Since writing this I have received Dr. Thomas's work from Paris.

ted in 1827, but which I did not receive until 1828. Without the least intercourse with each other, then, either by letter or otherwise, Dr. Thomas and myself formed, about the same time, similar views on the same subject. Nor is this an event of rare occurrence. On the contrary, many such might be cited. The reason moreover is obvious. Owing to new light being thrown on it by the progress of knowledge, a branch of science is ripe for discoveries, or opinions respecting it not before promulgated; and it is equally open to the inquiries of thousands. It would be singular, then, if some two or more of these, residing even in different parts of the world, and possessing no knowledge of each other, were not to form occasionally the same new views of it. The event is as natural, I might say as inevitable, as that two or more of a large party of Botanists or Zoologists, exploring separately the same tract of country, never explored before, should discover, about the same time, the same new species of plants or animals. Neither Dr. Thomas nor myself, then,

is to be suspected of plagiarism. Each is entitled to the claim of paternity toward the views he entertains. He certainly did not receive his opinions on temperament from me; because, my notes from which I lecture excepted, I am now writing on the subject for the first time.* As a matter of equal certainty, I did not receive my opinions on it from him; because it is known to many, that I entertained and taught them a year anterior to the date of his publication. Nor, although identical on most leading points, do our opinions respecting temperament concur on all. But, without further preface, I must proceed in my inquiry.

* This is true only in part. In the summer and autumn of 1822 my "Outlines of a Course of Lectures on the Institutes of Medicine" were written, and *printed* in 1823. In that syllabus I have spoken of a "Cephalic and nervous Temperament," a "Pectoral or Pulmonic and muscular Temperament," and an "Intestinal Temperament;" and my exposition of those topics, in my lectures, contained many of the elements of my present views on the same subjects. My "Outlines," however, being altogether elementary and academical, consisting of brief sentences and phrases, intended as texts for my Lectures, and remembrancers and indices for my class, though printed, were never

The difference between individuals, or rather classes, of the human family, which temperament is made to designate, appears to depend on two causes; diversity of organization in parts or the whole of the bodies of different persons, giving rise to a corresponding diversity in the vital properties; and difference of size and vigour in certain ruling organs of the system. The existence and influence of the former of these causes are in the highest degree probable; those of the latter certain. The one is susceptible of strong support, the other of proof that may be termed positive. By "organization" is here meant, the minute interior or radical struc-

published. Nor do I believe that any copies of them found their way to Paris. I am satisfied therefore that Dr. Thomas never saw them. Nor, if he had, could he have derived, from the hints they contain, any material information respecting my views of temperament, at the time when they were written.

I have also spoken expressly, in my "Outlines," of the prevailing temperaments of the body, and the diseases accompanying them, at the different periods of life. On this topic my lectures have been full, ever since my appointment to the medical school of Transylvania, in 1819; and the same views had been familiar to me many years previously.

ture of the tissues which compose the human body. That diversity in this creates a diversity in the vital properties, and that again a diversity in character, cannot I think be doubted. Whether the difference of organization here referred to consists in different proportions of the elements of living matter that form the tissues, united in the same way, or in their different modes of arrangement and union, or both, or whether it may not arise in part from different proportions of the simpler tissues entering into the formation of the more compound organs, is not known. Minute anatomy has not yet attained a degree of perfection competent to settle a point of such subtlety.

That I may be the more clearly understood in this inquiry, and that the result of the discussion in which I must engage may be the better judged of, my views respecting the effects of diversity of organization on vital properties require I think to be further illustrated. This can perhaps be sufficiently

effected by a few remarks on the nervous system.

No single nerve can perform two distinct functions. The optic nerve cannot subserve the purpose of hearing, nor the gustatory that of vision; nor is a nerve of voluntary competent to that of a nerve of involuntary motion; or the reverse. Each nerve, or rather class of nerves is capable of one mode of action, and no more. Of all other organs the same is true. Glands and secreting tissues produce each its own specific fluid, and muscles, *as such*, do nothing but contract. But those organs cannot interchange functions.—Such are the facts; and many other analogous ones might be adduced. To what are they attributable? Chiefly, I apprehend, if not exclusively, to diversity of organization. I know of no other cause to which they can be reasonably referred. Throughout the whole of living nature, as far as it has been explored, diversity in organization appears to be the only source of diversity in action; I mean vital action. True; we are not able,

at present, to distinguish any difference between the organization of a nerve of sensation and that of a nerve of motion; nor between the organization of one nerve of specific sensation and that of another. But that consideration constitutes no solid objection against the existence of such difference. It only indicates the limitedness of our research. And we must not make a premiss of our ignorance, and attempt to draw an inference from it involving knowledge. Reason affirms, and all analogy concurs with it, that the difference exists. Nor, as I hope and believe, will the labours of the anatomist, at a future period, fail to demonstrate it. It may be safely affirmed that between a nerve, a muscle, and a gland, the only difference known to exist is that of organization, according to the interpretation which the term has just received. Organize them alike and endue them with life, their properties will be similar, and they will act in the same way. This may be regarded as a primitive truth in physiology.

If then, in the person of the same individu-

al, difference of organization creates a specific difference between nerves and other parts of the body, may not a slighter difference in the organization of corresponding nerves and other parts produce a difference in the persons of different individuals? Does the optic nerve of one man differ slightly in organic structure from the optic nerve of another? Must not its function differ accordingly? Can the two men see all things precisely alike? We apprehend they cannot. That different individuals, whose vision is equally perfect and keen, do not see all things alike, is true; nor does it seem practicable to imagine any other cause, to which the phenomenon is ascribable, than some difference of structure in their optic nerves, or those parts of the brain with which they unite, or both. It is known to be a common occurrence for the same substances to communicate different tastes and smells to different persons, especially when the odour and taste are delicate. In such a case two individuals rarely concur in opinion, as to the pre-

cise degree and character of the sensations produced. They agree as respects the class and kind of sensation; but each contends for the existence of some peculiar modification of it. Nor can this be attributed to any other source, than a difference of structure in the nerves concerned. In health and disease, moreover, the taste,* smell, and sight of the same substances are often exceedingly different; a result that cannot be ascribed to any thing else, than a temporary constitutional difference in the nerves. Of secreting surfaces the same is true. This is strikingly

* Few things are more common in disease, than for the sick to loathe their favorite articles of food. In these cases a return of taste and other deranged sensations to their natural condition, is one of the most decisive evidences of convalescence. Chewers of tobacco and great lovers of coffee have usually a distaste for those articles during sickness. In such cases, it is a favourable sign for the patients to ask to be indulged in them. As respects coffee, this is true of myself. That liquid is my favorite beverage in health. During indisposition the flavour of it is offensive to me, and continues so until the termination of my complaint, when my taste for it returns. For this there must be a cause, which doubtless consists in a changed condition of the cerebral system.

manifested in the skin. Of every person of the Caucasian race the *cutis vera* is white; I might say equally so. Yet scarcely any two of them possess complexions of exactly the same shade. The reason is obvious. The *matter of complexion*, which is a secreted substance, and has its seat in the *rete mucosum*, differs in colour in different individuals. Why?—Because the action of the skin, its secreting organ, is different; and that again can arise from nothing but difference of structure. Thus might I pass through the whole human system, and show, that wherever a marked difference exists between the corresponding functions of different persons (and few phenomena connected with our race are more common) the diversity is to be ascribed to a like diversity in the structure of the organs by which the functions are performed. It is to be understood that I speak of the system in a healthy condition. Yet the same is true also in disease. Sick or well, as already intimated, organization gives us our character, and makes us what we are.

Is it our wish to extend our field of observation, and add to our store of facts on this subject, by directing our attention to the inferior animals? There again similar phenomena present themselves to us from every quarter. We discover between animals of the same race innumerable differences, which can be referred to nothing but differences in organization. Even of vegetables the same may be safely affirmed. Among them also, as already mentioned, the same species are known to be marked by striking diversities in appearance and character. Nor can any thing produce them but similar diversities in organic structure. Differences in the phenomena and habitudes of vegetables will not be ascribed to difference of *mind*, a mode of solution which has been attempted in vain, with regard to animals.

For the foregoing reasons, then, with many others similar in character, which it would be superfluous to adduce, I am compelled to believe, that, independently of all other causes, differences in human temperament are

to be attributed, in part, to corresponding differences in the organization of certain portions, or the whole of the body. Other things being equal, in consequence of this source of influence alone, one person differs from another in many of the qualities of both person and intellect. He is more highly gifted, sprightly, and vigorous, or the reverse; or he is more courageous or timid, generous or selfish, according to his organization.

But the second cause that was represented to be instrumental in diversifying the human temperaments is by far the most powerful. It will be remembered to have been, "difference of size and vigour in certain ruling organs of the system." The organs alluded to are those contained in the three great cavities of the body; the chylopoetic, situated in the abdomen, and including the stomach and intestines, with the liver, pancreas, mesentery, and lacteals; those of sanguification and circulation, situated in the thorax, and consisting of the lungs, heart, and blood vessels; and the brain, with its appendages,

the spinal cord and nerves. These three *groups* (for the brain is *multiplex* as well as the other two) are not only the ruling organs in the person of man; connected with the hard and soft parts that enclose them, they *constitute the person.* The upper and lower extremities are but appendages; important and necessary, it must be acknowledged; but still appendages. The individual can exist and be a human being without them. Nor have they any influence in imparting constitutional character to their possessors. Standing only in the capacity of subordinates to the controlling organs, they are not only nourished and put in motion by them; they labour mechanically for their uses, and serve as instruments to execute their purposes. They are composed of the extreme ends of the organized matter of the system, constitute only its out-works, and possess but little influence over its central parts. This representation rests on evidence that may be termed demonstrative. Many persons destitute of the upper or lower extremities, or both,

have strong characters and well marked temperaments. But the extremities, if deprived of the influence of any one group of the ruling organs, are converted not only into useless but lifeless masses. Of the skin, muscles, and bones, which compose the head, neck, and trunk of the body, the same is true. Of themselves they possess no character, and can therefore bestow none. They also are but appendages to the organs they cover, affording them a secure lodgement and protection from external injuries, and aiding them in the performance of some of their functions. And from this alone is their importance derived. Were it possible for them to exist apart from the viscera they contain, their grade of being would be below that of many vegetables. Most fatal diseases, moreover, have their original seat in the viscera of one of the three great cavities of the body, and no disease originating elsewhere can become fatal, until, by sympathy or metastasis, some of those parts are deeply affected. To enlightened physiologists this statement presents but

a series of familiar truths. To the groups of organs exclusively, then, I repeat, contained in the abdomen, the thorax, and the cranium, must we look as the main source of human character. And that character is different according to the predominance, in different individuals, of one group or another, or of any two of them. An equilibrium between the three groups constitutes another variety, by bestowing on character a corresponding equilibrium. Let the word *temperament* be substituted for "character," and what is true of the latter will be so of the former. As already mentioned, the organs referred to will be its source; and the differences in their predominance will give diversity to it.

To remove as far as possible obscurity and uncertainty from the remarks I have to offer, it is requisite that I should be more explicit, with regard to the functions of the three groups of organs that have been said to constitute the human person. The digestive apparatus prepares, from the alimentary matter received into the stomach, chyle destined

to be first converted into blood, and in that form to convey nourishment and life to the different parts of the body. And in proportion to the power and activity of this apparatus is the amount of chyle it forms out of a given quantity of food. It may be worthy of remark, that, as relates to strength and vigour of action, there exists usually an adjusted balance between the chylopoetic organs and those of nutrition and secretion; the two latter appropriating to the uses of the system and removing out of it, what the former prepare to be introduced into it. Were the case otherwise, perpetual derangement of some sort would prevail. Moderate deviations from this balance may exist, without producing fatal injury; and it will appear hereafter that this is the case under some of the temperaments. The chief function of the lungs is to form arterial blood out of a mixture of venous blood, chyle and lymph. In the process of arterialization, the blood receives an additional supply of life, to compensate its loss of that attribute in its round of circula-

tion; so that the arterial is more highly vital than the venous. The more powerful the lungs are, the more vigorous will be their action, and the greater its effect. The function of the heart is to circulate the blood, a process in which its *mode* of action is purely *mechanical*, while its *spring* is *vital*. In performing this function it throws the venous blood into the lungs, to be arterialized, and the arterial into all other parts of the body, to nourish and vivify them. In proportion to *its* power also is the vigour and efficiency of its action. Between its strength and that of the arteries a correspondence exists, else the harmony of the system is broken. The cerebral system, including the nerves, has been said to be multiplex. Considered in mass, its function is twofold; the production of *feeling*, and that of *intellect*, the latter embracing voluntary motion. Involuntary motion both perceptible and imperceptible also depends on it. To each different sort of feeling, as well as of intellection, a subordinate portion of brain is appropriated, in the char-

acter of a specific organ; precisely as, in every other part of the body, each function is performed by a peculiar apparatus prepared for the purpose. I need scarcely add, that, conformably to what is true of the other organs of the system, the vigour and efficiency of the action of the brain is in proportion to its power.

Two points vitally important to this discussion are now to be considered. On what does the power of the three groups of governing organs depend? and how can their actual possession of power be dicovered? To these questions the answers are obvious. Other things being equal, the power of the organs is in proportion to their size; and their size is known by that of the cases in which they are contained. In plainer terms; the size of the brain is known by that of the head; the size of the lungs and heart by that of the chest; and the size of the digestive apparatus by that of the abdomen; I mean when the parietes of the latter cavity are not preternaturally distended by fat.

Does any one doubt whether the power of the organs I am considering depends on their size? Let him look through nature and his doubts will be removed. He will perceive that what I have said of them involves so much of a universal law, as to be true of all things of which we have any knowledge. There is reason to believe that an exception to it would be an anomaly in creation. Whether the object examined be animate or inanimate, other things being alike, its power and influence are in proportion to its magnitude. No matter how spacious and diversified the field we traverse in investigating this subject may be; the larger the more conclusive; for the same result presents itself in every stage of our inquiry, and from every quarter. The proposition is as self-evident, as that the whole is superior to a part. Is the sun the most powerful orb in the solar system, and does he control all the others? He is also the largest. Are the primary planets more powerful than their satellites, and do they govern them in their movements? They are likewise larger.

Contracting the sphere of our observation, and taking a survey of things that are more familiar to us, we find that a large mountain has more influence in giving character to the region around it then a small one. In that respect the Alps are more powerful than the Apennines, and the Andes than the Allegany. Of rivers, lakes, and arms of the sea the same may be affirmed. The more spacious they are, and the larger the bodies of water they contain, the more powerful they are in their effects, and the more extensively they are felt. As respects all forms of living matter the same law prevails. Other things being equal, their magnitude and power are in proportion to each other. Shall we direct our attention, in this inquiry, to the trees of the forest? the larger will be found the more powerful. Shall we examine the inferior animals? There again, the condition of *cæteris paribus* being observed, size is an accurate measure of power. Instances innumerable and familiar to every one might be given in proof of this. As relates to the human race the same may be

maintained. The large man surpasses the small one in power. To the different organs of the body the rule is no less applicable. A large bone is strong, a small one comparatively weak; a large muscle possesses more power than a small one; and so does a large nerve. To adduce a few facts in proof of this latter position will tend to confirm my views, and may not, in other respects, be without interest. They shall be drawn chiefly from the comparative strength of the external senses in different animals.

In our examination of this subject we shall find, that in proportion to the strength and perfection of any sense is the size of the nerve on which it depends. Man possesses not only *touch*, properly so denominated, but the external sense of *feeling* generally, in a much higher degree than any of the inferior animals. And, in precise correspondence to this greater strength of function, the nerves subservient to it are much larger than in those beings, in whose economy it is comparatively defective. Nor is this all. The keenness of the

sense of feeling is very different in different parts of the body of man; and in proportion to this difference is that of the size of the nerves which supply those parts. He possesses this sense in the highest perfection in his hands and fingers. And the reason of this is found in the magnitude of the nerves that run to those extremeties. Demoulins, a late writer on Comparative anatomy, tells us, that, "in the spinal nerves of man, the dorsal roots, or those belonging to *sensation*, *in the nerves supplying the arm*, have an excess of volume and of surface at least *five times greater*, both for each individual fibre, and for the bundle resulting from them, than the anterior roots, or those belonging to motion." And further, that "the roots of sensation in the spinal nerves going to the arm are about *five times larger* than the corresponding roots at other parts of the spinal cord, which are distributed to parts where touch is imperfectly possessed." By way of additional illustration and proof of the proposition for which I am contending, I might further ob-

serve, that in proportion as any species belonging to the animal kingdom is more remarkable for strength of feeling or strength of voluntary motion, is the relative size of the nerves subservient to those two functions. The common belief is, that, in proportion to the size of their bodies, the nerves of the inferior animals are larger than those of man. This is true only of the nerves of motion; the reverse being true of those of sensation. The reason is plain. In proportion to their bulk, most of the inferior animals have more muscular strength than man; but they have less acuteness of feeling. The nerves of the former therefore are large in them, and those of the latter small. Our cows, horses, and other domestic animals furnish ample proof of this. Their strength is great and their feeling comparatively dull. Corresponding to this, their motive nerves are large, and their sensitive ones small. It will be understood that I speak of the external sense of *feeling* alone, not of those of seeing, hearing, tasting, or smelling, some of which, in our domestic

animals, are exceedingly acute, and the nerves subservient to them large in proportion. The wings of bats and the tails of some species of monkeys are known to be remarkable for keenness of feeling; and their nerves of sensation are correspondingly large. The tail of the kangaroo has great muscular power; and its nerves of motion are unusually large. The trunk of the elephant is immensely powerful, as well as highly sensitive. In accordance with this is the size of its nerves; both sets having uncommon magnitude.

To *taste* and *smell* similar remarks are applicable. In the African race those senses are keener and stronger than in the Caucasian. So is the sense of *smell* in the American Indian. Of this difference the cause exists in the different sizes of the olfactory and gustatory nerves. In the African, both those organs, and in the Indian, the former of them, have a much larger volume than in the Caucasian. And where they receive the olfactory and gustatory impressions, they are spread over a larger surface of mucous membrane.

Although the nose of the African is short, the entire region in him tributary to the sense of smelling, throughout which the olfactory nerves are exposed to the impression of odorous matter, is much more extensive than in the Caucasian. Of the North American Indian the same is true. His olfactory region also is more extensive than that of the white man. Innumerable facts in the natural history of the inferior animals are no less to my purpose. Of all the canine race the Greyhound has the weakest sense of smell. He has also the smallest olfactory nerves. His slim muzzle testifies to the very limited space over which they are spread in his nares. In consequence of the imperfection of this sense in him, he pursues his prey entirely by his eye. In the fox-hound, and every other variety, that follow their game by the scent, the nares are spacious and the olfactories large. The same is true not only of every sort of the dog kind, but of every species of inferior animal, whose sense of smell is keen and strong.

In most quadrupeds the sense of hearing

is keener than in man. This is owing to a threefold cause. The external ear is larger and better fitted to receive and concentrate the vibrations of the air which are tributary to sound; the portion of the internal ear over which the auditory nerve is spread is more extensive; and the nerve itself is larger. Facts in proof of these three positions may be derived from the size of the auditory nerves, and the structure and size of the external and internal ears of sheep, cows, horses, deer, and hares. Compared with the same parts in man, they are very large, and their forms are better suited to the purpose of hearing. Additional proof to the same effect is derived from the large-eared bat, whose auditory nerve corresponds to the organ without, and whose sense of hearing is exquisitely acute. The importance of a large external ear is further confirmed by the benefit of an ear-trumpet to those whose hearing is impaired. It collects and throws into the internal ear a greater volume and force of vibratory movement than would otherwise enter it.

To vision the same principle is equally applicable. The strength and acuteness of that sense also are in proportion to the size of the optic nerve, and the extent of the expansion of it, where it receives the impression of the rays of light. Proof of this might be drawn from a thousand quarters. But I shall refer chiefly to that afforded by birds of prey. In the eagle, the falcon, and the vulture, whose vision is almost incredibly distinct and powerful, the optic nerve is exceedingly large, and its expansion into retina uncommonly extensive. Their whole optical apparatus greatly exceeds in magnitude that of other birds, whose vision is less perfect. We learn from Demoulins that, "to effect the purpose of increasing the size of the optic nerve in these animals, without adding injuriously to that of the eye itself, an admirable contrivance has been resorted to. Instead of forming a single membrane lining only the inner surface of the posterior chamber of the eye, as in man and animals of ordinary vision, and consequently only equalling in ex-

tent the sphere of the eye, the retina in these quick-sighted birds of prey is found to be composed of a great number of folds, each hanging loose in the eye, and augmenting, in an extraordinary degree, not only the extent of nervous surface, but the mass of nervous matter." Nor is it the optic nerve alone that is augmented in size in these birds of intense vision. The optical ganglion, or that portion of the brain to which the nerve is united is equally augmented. Thus, in the *stryx flammea*, or screeech-owl, whose sight is imperfect, the two optical ganglions make about a *twentieth part* of the brain, while in the eagle they make a *third part* of it. For this fact also I am indebted to Demoulins. Nor have I the least doubt that, in every case, where any nerve or set of nerves is peculiarly large, the portion of the brain to which they belong, and by which they are influenced and commanded, is correspondingly large. This I apprehend is as true of the cerebral portion controlling the nerves of voluntary motion, as of that which co-operates with the

nerves of sensation. True; most of the nerves of voluntary motion come from the spinal cord. But no matter; they derive their efficiency from some portion of the brain. And when they themselves are unusually large, so, I feel persuaded, is the cerebral portion which gives them their energy. That fitness and harmony which every where prevail, and constitute much of the wisdom as well as of the beauty of creation, warrant me in asserting that it must be so. I doubt not that, by means of anatomical researches, that which I offer as matter of opinion now, will become history hereafter. That it may produce its full effect, it appears indispensable that a large nervous apparatus should be connected with a large cerebral one.

In as much, then, as, other things being equal, size gives power to every thing else, we are not only justified in believing; on grounds of analogy we are compelled to believe, that the same is true of the organs contained in the cranium, the thorax, and the abdomen. When they are in a sound and

natural condition, their size also is the measure of their power. Were not this the case, they would be either altogether abnormal, or subject to laws that govern no other kind of matter, whether organic or inorganic, of which we have any knowledge. But the position I am contending for is not to be regarded as a mere inference in a process of reasoning. It will appear hereafter that it is a positive fact, which observation has discovered, and continues to confirm.

I have alleged that the size of the three groups of ruling organs may be ascertained by that of the cases in which they are contained. Nor do I perceive on what ground any one, who is even moderately acquainted with the structure of the human body, can controvert the belief, or cherish the slightest doubt on the subject of it. In healthy persons (and my remarks relate only to such) the size of the brain is necessarily known by that of the head. As the viscus completely fills the cranium, the case cannot be otherwise. Although the bones of the head and

the soft parts that cover them are thicker in some individuals than in others, the difference is so small as not materially to affect the result. The chest is filled by the lungs, heart, and large blood-vessels. Its measure, therefore, cannot fail to be the measure of them. Any deviation from exactness in this, that may be produced by varieties in the thickness of the skin, muscles, and other parts, is of no moment. Of the chylopoetic viscera the same is true. They also fill exactly the cavity prepared for them. The size of the abdomen, therefore, affords a knowledge of their size sufficiently accurate for all practical purposes. By a mere inspection of the person of man, then, the absolute measure of the groups of organs I am considering, as well as their magnitude in relation to each other, can be fairly ascertained. And it will appear on examination, as already stated, that the predominance in size and energy of any one or two of them, always imparts a corresponding diversity to the human character. Does the brain predominate? the in-

dividual to whom it belongs is more remarkable for the vigour of his intellect or feeling, or both, than for any other constitutional quality. These modes of mental manifestation constitute the natural functions of the brain; and when of an order unusually high, they give a peculiarity of character to the whole system. The person thus endowed feels more keenly, thinks more strongly, is more eager in pursuit of knowledge, and attains it with more facility. His relish for pleasure is also inordinately keen, and he pursues it at times with burning ardour. Such was the constitutional character of Mr Fox, and also of our distinguished countryman the late Mr Bayard. I need scarcely add, that this predominance of sensibility and mental action must necessarily modify the diseases the individual may sustain. But of this I shall speak hereafter. Do the lungs, heart, and blood vessels predominate? A larger volume of highly arterialized blood is formed, and thrown more forcibly and in greater quantities throughout the system. From the

abundance of that fluid, and the superior size of the vessels conveying it, those parts of the body nourished by the red blood will be comparatively most copiously supplied. But it is more especially the muscles that are thus nourished. They will be therefore large and powerful. Hence persons with broad and full chests have well developed and vigorous muscles. In proportion to their size their animal strength is necessarily great. Nor can such constitutional peculiarities fail to be productive of peculiarities in disease. Do the chylopoetic viscera predominate? The amount of chyle formed is very large in proportion to the quantity of food eaten. But the lungs, heart, and blood-vessels being comparatively small, neither is sanguification abundant and perfect nor circulation vigorous. The blood is not either highly arterialized or animalized. Its amount of red globules is small, and it circulates feebly through vessels of a limited size. The consequence is, that the muscles receive less red blood, and are less fully nourished; the system at large

is not so highly endued with life, and the soft parts generally have a lower tone. The individual thus marked is less robust and vigorous than one whose system is supplied abundantly with highly arterialized blood, and less intellectual and sprightly than those whose brain predominates. It is almost needless to say, that, under such circumstances, disease must be modified in conformity to the constitution.

From the preceding views it clearly appears, that the comparative standing of individual man, as relates to his race, is graduated by the predominance of his leading organs. Do his abdominal viscera preponderate? He has much of the animal in him, and his grade is low. Are his thoracic viscera most highly developed? His qualities are of a superior order; but he still partakes too much of the animal. Does his cerebral system predominate; and is it well developed in all its parts? He rises above the sphere of animal nature, and stands high in that of humanity. He is formed for an intellectual

and moral being, with no more of animality in his constitution, than is necessary to give him practical energy of character.

This subject may be further illustrated by a reference to some of the animals below us. The worm commonly denominated a grub is but little else than a mass of abdominal matter. It is therefore one of the humblest and grossest of worms. The insect has also a large abdomen, with a very small chest, and a smaller head. Hence, though superior to the grub, it is low in the scale of animal nature. Reptiles and fish are more elevated, because their abdominal viscera preponderate less. But still they do preponderate; and therefore the rank of the animals is humble. In the hog the abdominal viscera are most strongly developed, and hence his standing among quadrupeds is low. The same is true of the bear and the ox, and also of the sheep and the goat, but in an inferior degree. The horse, especially the barb and the race horse, furnish no bad specimens of the mixed or balanced temperament. When the

latter is undergoing preparation for the course, the object of his keeper is to make the thoracic temperament preponderate as much as possible, for the time, in order to increase his vigour and endurance; in the language of the turf, to give him more strength and "better bottom." The war-horse approaches the thoracic temperament. In the canine race, more especially in the Grey-hound, the thoracic viscera hold the ascendency. Hence the muscular power of the dog is greater, and his grade among quadrupeds higher than those of most of the preceding animals. The same is true of the wolf, the panther, and the tiger. In some dogs there is a considerable cerebral developement; but it is never large enough to counterbalance the thoracic. Of all animals, the lion affords the most finished specimen of thoracic preponderance. In proportion to his size, his lungs and heart, especially the latter, are immensely large. And his muscular power corresponds to them. The magnitude of his heart is generally considered the cause of his boldness. Hence a

very courageous man is said to have a *great* heart, or to be *lion-hearted.* All this is popular error. The heart is but a muscle; and, in man, has no more connexion with courage than the gastrocnemii muscles; nor, in the lion, than the muscles that move his tail. Courage is exclusively a cerebral attribute, and has its seat in an organ specifically appropriated to it. In none of the inferior animals does the brain preponderate. That preponderance belongs to humanity, and, as already mentioned, indicates its highest grade. Of all the beings below us, some of the ape tribe have the highest cerebral development. And they approach nearest to man in their degree of intellect. This is further proof, that, other things being alike, the brain gives the measure of mental power. I have lately seen a publication, in which it is gravely asserted, that the large ourang-outang catches crabs with a stick, and makes a rude basket of osiers to contain them. Notwitstanding the well known sagacity of that animal, this statement savours strongly of the "tale of a traveller."

Such are the principles on which the present inquiry rests, accompanied by the fullest illustration that the extent of this essay permits me to give them. In their application to man, they appear to throw new and valuable light on the human temperaments. They profess to substitute fact for assertion, and reason for conjecture, and to render intelligible that which has been heretofore buried in the mysteries of the schools. Their chief value seems to consist in their offering a reason, easily understood, for the various sorts and degrees of health enjoyed by different individuals, as well as for the modifications of the diseases they suffer, and thus expounding in some degree the philosophy of their nature. If they do this, I need scarcely add, that their usefulness will be great. In that case, they also indicate a process, by which the balance of the human system may be better preserved than it has hitherto been, and likewise more easily restored when deranged. Their importance therefore in practical medicine cannot be held doubtful. Hereto-

fore temperament has been regarded as a kind of *entity*, superadded to the systems of those who possess it. But, by the principles here laid down, it is made to depend, like every other human attribute, on the condition of some of the organs of the body. And this is the doctrine that must ultimately prevail, because it is true. Whatever we have, of a constitutional character, and whatever we are, in a constitutional point of view, is the product of organization. This is true, if any thing be so in the philosophy of man.

Considered in relation to these principles, temperament may be divided into seven varieties. 1 The mixed or balanced, in which the ruling organs are in fair proportion to each other; 2 The encephalic; 3 The thoracic; 4 The abdominal; 5 The encephalo-thoracic; 6 The encephalo-abdominal; and 7 The thoracico-abdominal. Before entering on the consideration of these varieties separately, it is necessary to observe, that they are not altogether permanent. They change, intermix, and are, in some cases, even

converted into each other, at different periods of life, from infancy to old age. Some of these variations, connected with the circumstances under which they occur, will be referred to hereafter.

1. *The mixed or balanced variety.* In this the name explains the temperament. The external marks of it are plain. They consist in a well adjusted proportion between the sizes of the head, thorax, and abdomen. If the limbs are in harmony, the symmetry of the entire person is complete. Although individuals, in whom this temperament prevails, are usually above the middle height, and well formed, they are not necessarily so. They may be of any stature, and any shape, straight or crooked, provided the three great cavities and their contents be accurately balanced. This is not the temperament of either early life or old age. It commences with manhood, and continues until the fortieth or forty-fifth year, and then passes into somewhat of the abdominal. The Apollo Belvidere, by Phidias, is an exquisite specimen of

it. But some modern artists have violated it, in painting that statue, by making the chest and the head too large. Although the manifestation of strength, majesty, and intellect is heightened by this, the beauty of the youthful god is marred. The figure, though more imposing, has lost its charm.

This temperament is much more common in the United States and in France, than in Great Britain, or perhaps any other country in Europe. It is also witnessed in many persons of the higher orders in Persia and Turkey. Those who possess it having no strong constitutional tendency to disease, unless in cases of peculiar hereditary predisposition, experience good health, and enjoy existence in an eminent degree. Being equally free from apathy and excessive sensibility, they are strangers alike to the monotonous slumbers of some, and the stormy and tormenting passions of others. Although their capabilities both mental and corporeal are sometimes great, they are in general better suited to action than deep deliberation. They

rarely attain the summit of renown, either as statesmen or orators, philosophers or warriors. They are not formed to lead the world, revolutionize nations, or, in any way, create a new era in human affairs. This temperament would seem to have constituted the prototype of Homer's Patroclus and Paris, much more than of Hector and Achilles; yet the two latter were far more conformable to it than Ajax or Ulysses. The Euryalus of Dryden is a fine specimen of it. When complete, its three most prominent attributes are, manly elegance, personal activity, and blooming healthfulness. As it does not create any permanent liability to disease, neither does it in any way peculiarly modify it.

2. *The encephalic.* In this variety the head is relatively large, but is not always equally developed in every part, a circumstance which varies greatly, as will presently appear, the characters of those who possess the temperament. The development of the thorax and abdomen is moderate, the person lean, and the countenance expressive of in-

tense feeling and deep passion. In some individuals, however, the countenance beams with intelligence, without much passion, while, in others, manifestations of powerful intellect and passion are united. The thoracic and abdominal activity is never high; yet in many instances the personal hardihood and endurance are invincible. It is men of this temperament alone that can immortalize themselves by great achievements, good or bad. All history and observation testify to this. Is the development very large in the moral and intellectual regions of the brain, and so moderate in the animal as to be held fully in check? The individual will distinguish himself by a dignified purity of deportment, and by the performance of great and good deeds. He may become illustrious as a moralist, a philosopher, a statesman, or a philanthropist; or he may unite these characters, and be celebrated in them all. Such were Zeno, Seneca, Sully, Walsingham, and Sir Walter Raleigh, all of whom had large moral and intellectual developments, and

controllable animal ones. Are the intellectual and animal compartments largely developed, and the moral ones very limitted? The possessor of this temperament will distinguish himself by daring and memorable acts of vice. Such were Cataline, Pope Gregory VII, Richard III, and Louis XI. Aided by their powerful intellects, characters of this description perpetrate their crimes under plausible pretexts, that they may indulge their evil propensities in security, and with the greater effect. Are the animal and merc knowing compartments largely developed, and the moral and reflecting very slightly? As relates to vice and profligacy in their foulest shapes, this is the worst of all temperaments. Nothing more prone to depravity can be imagined. The person possessed of it delights in some sort of animality alone; and if he ever engages in any thing higher or purer, it is for a sinister purpose, that he may return to his chosen indulgencies in more security, or on a broader scale. But possessing great force of character, he is a

great animal, and commits corresponding enormities. In gratifying his propensities nothing moderate satisfies him. His crimes therefore are as great and destructive as his means can render them. He sleeps but to dream of evil, and wakes but to commit it. Such monsters were Nero, Caracalla, Pope Alexander VI, Pope Martin V, and many others, whose likenesses I possess, and whose detestable crimes make a part of history. Is the development very large and equally so in all the departments of the brain, animal, moral, and intellectual, giving to the head unusual size? The individual possessing it has a lofty and powerful character, is capable of attaining the highest renown, and making an impression, not to be erased, on the age and country in which he lives. His career may be occasionally stained by irregularities and checkered with clouds, but will be brilliant in the main. His designs are vast, because he feels his power, the instruments with which he works are men, and he wields them in masses. The term *little* has no place in his

vocabulary, nor its prototype in his thoughts. His aim is greatness of some kind—high achievement, or deep catastrophe. Such men were Pericles, Cæsar, Henry IV, Napoleon, Franklin and Hamilton. Each of these was alike ambitious, and aspired alike to the *high* and the *great*, but from different motives, and in different ways. All men who have immortalized themselves by their pens, from the GREAT STAGIRITE to the GREAT UNKNOWN, have been of this temperament. Satisfactory testimony to this effect is derived from the models we possess of the heads of Homer, Virgil, Cicero, Dante, Bacon, Shakspeare, Milton, Voltaire, Rousseau, and Johnson, and from the size and form of the heads of many writers who are still living. In fact, we may as well look for a giant in bodily strength without large muscles and bones, as for a mental giant without a large brain; as well for a Hercules with a slim person, as for a Socrates with a small head.

This temperament is much more common among men than women, and in free coun-

tries than in those where despotism prevails. The reason of the latter fact is plain. The brain, like every other organ of the body, is enlarged by suitable exercise, and dwindles under inaction. But in nations as free as England and the United States have long been, and as France has been for a shorter period, it is exercised much more constantly and favourably, than it can be under a despotic and jealous government, where even thinking freely is frowned on, and as far as possible prevented. In the free countries just mentioned, therefore, the encephalic prevails more extensively than in any others. It is also met with much more frequently in cities than in the country, among mechanicians, artists, scientific, literary, and professional men, and cultivated characters generally, than among servants, day-labourers, and common operatives in husbandry. To speak in terms still more comprehensive, it belongs to those who pursue some occupation in which the intellect is exercised, much more than to those who work only with their muscles and

bones. Among the latter it is rarely if ever found. All correct observation testifies to this. So do the different measures for hats, to suit different casts of customers, in the great hat-factories of London and Paris. In those establishments hats for adults are of three sizes. The first or lowest size is for servants, because their heads are small; the second for farmers and common mechanics; and the third and largest for men of intellect and mental cultivation. The reason of this is so obvious that it is needless to state it. The fact has been familiar to hatters for centuries.

The encephalic, in cases where it is the temperament of manhood, glides, in the decline of life, into the encephalo-abdominal, which will be described hereafter. It is in consequence of this change in it giving more vigour to the chylopoetic organs, that individuals frequently recover, about this period, from long-standing dyspepsia. When highly developed, it entails on those who possess it a liability greater than common to some

diseases, and produces peculiarities in others. From the facility with which preternatural excitement, with its concomitants, may be produced in the brain, it is the temperament most subject to great and frequent irregularity of spirits, melancholy, and mental derangement. It creates also a stronger tendency than any other temperament to phrenitis, and delirium in fever. These are the complaints more especially of the prime of manhood. In the decline of life, and in old age, the liability of those whose cephalic development is very large is to apoplexy and palsy. From the strong tendency of the brain to overwork and exhaust itself, it is the organ most seriously endangered under this temperament. But the lungs and chylopoetic viscera are also endangered. Does the brain, by its own labours, expend too great an amount of vital energy? In doing this it robs the thoracic and abdominal viscera of a part of what they should receive, and thus enfeebles them. Hence the liability of those, whose systems are thus unbalanced, to pulmonary consump-

tion and dyspepsia, more especially the latter. Torpor, or some other kind of chronic derangement of the chylopoetic organs, is almost a habitual concomitant of the encephalic temperament. It necessarily therefore predisposes, in a certain degree, to fevers arising from gastric irritation, and to constipation of the bowels. When more than usually developed in infants it produces a tendency to hydrocephalus internus, and sometimes to convulsions. The latter predisposition continues in some instances until the period of puberty. Cæsar, whose developments were strongly encephalic, was always subject to epileptic convulsions, except when under the excitement of military enterprise. It is persons possessing this temperament that suffer most from repeated paroxysms of high-wrought passion, and intemperance in the use of intoxicating drink. Such practices, if persevered in, produce at length a constant irritation, amounting perhaps to subacute inflammation of the brain and spinal cord, which not only destroys comfort and useful-

ness, but terminates in unappeasable fretfulness, tremors, startings, and lancinating pains in all parts of the body, amounting in the whole to one of the most deplorable forms of human wretchedness. This is not the temperament of robust health.

3. *The thoracic.* Under this variety the head is small, usually round, and covered with thick curling hair, the abdomen of limited dimensions, the chest spacious and powerful, and the muscles swelling and firm. Whether fair and ruddy or otherwise, the complexion is strong. Respiration is full and deep, and the action of the heart regular and vigorous; and the pulse has great volume. Like the result, in every other kind of inordinate vital action, the animal temperature is high. This temperament, in which neither feeling nor intellect prevails, begins to show itself about puberty, and continues until the decline of life, when it undergoes a change. The Farnesian Hercules is the *beau ideal* of it. This shows that it was known to the ancient Greeks, who were probably indebted

for their acquaintance with it to observations made on the persons of their wrestlers. In modern times it is strongly developed in boxers and porters, and sufficiently so in bakers, wood-choppers, operative agriculturists, and others who have been habituated to labour from their boyhood. I have observed no little of it among the London boatmen, the occupation of whose life is to ply the oar, a mode of exercise well calculated to develop the chest, together with the muscles of the upper extremities. I have seen good specimens of it also in the African race.

The thoracic temperament never occurs in women. It belongs to men alone, and fits them peculiarly for labour, fatigue, and deeds of strength. It qualifies them to obey rather than to command; to be efficient soldiers or sailors rather than accomplished officers. So robust and firm is the constitution, and so sound the health of those who possess it, that it can scarcely be said to predispose to disease. The complaints that occur under it are inflammatory, assuming the form of pleu-

risy, peripneumony, carditis or some other affection of the heart, and rheumatism, but rarely attacking the abdominal viscera or the brain. They are usually moreover produced by indiscreet exposure, violent exercise, or some sort of excess, which the individual fearlessly incurs, from a belief that his hardiness will prevent it from injuring him. In treating them, a liberal employment of the lancet is requisite. Unless the brain suffer from mechanical violence, or some overwhelming animal passion, neither madness, epilepsy, nor any other form of cerebral derangement is much to be dreaded by those possessed of this temperament. Their liability to tetanus from punctured or lacerated wounds forms no exception to this. In that affection the cerebral system suffers by sympathy with the part originally injured.

4. *The abdominal.* This temperament is easily recognised by the character it imparts to the person and intellect. The pelvis is broad in proportion to the shoulders and thorax, the abdomen large and prominent, and

the adipose matter abundant, filling up the interstices of the muscles, and often forming a layer between them and the skin, in consequence of which the limbs are round and smooth and soft to the touch. In such constitutions, ecchymosis succeeds, with unusual readiness, to slight contusions. Circulation in the skin being feeble, the complexion may be fair and delicate, but never very ruddy or strong. The size of the head is limited, the intellect moderate, the eye deficient in lustre and the countenance in expression, and the movements heavy and seldom graceful. The abdominal viscera seem to draw every thing into the vortex of their action. The amount of vitality is evidently below its common measure in the human system, and, in some instances, the flesh seems to hang as a load on the spirit. It is to be understood that I am speaking of the phenomena of this temperament, when it is highly finished. In a moderate condition of it the manifestations of it are weaker. The animal appetite for food predominates. Yet the individual neither

eats voraciously nor much at once. His delight is to eat frequently and slowly, in consequence of the pleasure it affords him, and then while away his time until the next meal. Without intending to make a degrading comparison, but merely to illustrate my views, I might correctly say, that his deportment, in this respect, resembles that of the hog. He eats, sits or lies down to slumber, and rises at the call of appetite to eat again. His secretions, except that of adipose substance, and perhaps also of mucus, are scanty. In a particular manner he perspires very moderately. His skin has a temperature unusually low, and never throws out on any part of it a heavy growth of hair. The hair covering the head is fine, soft, and straight, and rarely very dark coloured. The only organs of the body that act vigorously are the chylopoetic and nutritive, especially those that form fat. The muscles being defective in vitality and tensity, as well as in size, their strength is never great. Individuals possessing this temperament have neither enthusiasm nor a spirit of

enterprise, and are equally deficient in every other ingredient of greatness. Although sufficiently healthy, under common circumstances, they are easily broken down by labour and hardship. Hence they make indifferent soldiers and sailors. Their diseases are those of torpor and depression, rather than of high excitement. If fever attack their brain, it is more likely to produce *delirium mite* than *delerium ferox.* Their want of vital vigour renders it difficult to cure their febrile complaints; difficult I mean to eradicate them completely. For in proportion to the vitality of the system is its susceptibility towards medicinal agents, and its own curative action under the existence of disease. Hence the liability of febrile patients, having the temperament I am considering, to obstructions producing dropsy, enlargement of the lymphatic glands and other parts, cutaneous eruptions which terminate at times in indolent and obstinate ulcers, and other chronic affections difficult to be removed. In no case does the system work vigorously. Owing moreover

to the abundant production of chyle, united to a limited excretory discharge, this temperament predisposes to a degree of obesity and vascular fulness, which sometimes terminates in hemorrhagy or apoplexy. Does an acute affection attack the thoracic viscera? It is much more likely to be peripneumonia *notha* than peripneumonia or pleuritis *vera*. And unless it be skilfully treated, hydrothorax, asthma, or some other chronic complaint will more probably follow it.

It has been already stated that, at an advanced period of life, the encephalic passes, in part, into the abdominal temperament. On that occurrence the abdomen absorbs and concentrates much of what remains of vital energy, its contents are enlarged, the brain, in common with the nerves and muscles, loses not only its vigour but somewhat of its size, and the individual exhibits no small share of the mental dulness and imbecility, with which the temperament is associated in cases where it is original. This change occurs much more certainly and in a higher de-

gree in men of the encephalic temperament, who, after a life of great activity, become indolent. The vital energy which had been previously expended in cerebral and muscular exercise, concentres now in the abdominal viscera, strengthens their functions, and adds to their size. In those who persevere in their active habits, whether of muscle or brain, the change is much less striking. Voltaire, Priestley, Jefferson, and the late Dr. Rush were instances of this. Their mental activity continued until the close of their lives, and their change toward the abdominal temperament was very slight. Voltaire's leanness has been attributed to his excessive potation of *strong coffee*. This is a mistake. It was the result of his indulgence in *strong thought*. Napoleon drank more strong coffee than he did, and became fat on it; but he was not so morbidly encephalic. Hard-working men, who continue their labours until an advanced age, never exhibit the temperament I am considering. The reason is plain. They expend in muscular

action that degree of vital energy, which the abdominal viscera require to render them powerful. Let them decline a laborious life and live comfortably, and they will then become fat. Why? Because the energy, which had been previously wasted by the muscles, centres now in the chylopoetic viscera and nutritive organs, and gives them vigour. The abdominal temperament prevails more in Holland and the Netherlands, than in any other portion of Europe. It is also more frequently met with in England and Germany, than in France or the United States. The diseases of those who possess it seldom require the bold and vigorous use of the lancet. Being slow in their progress, they allow the physician time in his contest with them, and usually yield to secretory remedies. Suitable exercise does much toward their removal.

5. The *encephalo-thoracic.* This temperament is a type of power both bodily and mental. Its compound name expresses fully the external appearances that mark it, as well as the attributes that always accompany

them. With an abdomen of moderate dimensions, the head of the individual who possesses it is large and vigorous to conceive and direct, and his chest and muscles powerful to execute, and hardy to endure. It is the temperament of masculine and comprehensive thought and strong propensity, united to energetic action, rather than of seclusion and profound meditation. As in all other cases, the character is varied in it according to the portion of the brain that is most largely developed. He to whom it belongs feels himself in his proper sphere when he is among men, and is well fitted to act his part in times of tumult and scenes of difficulty. Is his brain large in each of its compartments? If an occasion present itself, he not only mingles in the moral storm, but aspires to direct it. In case of his becoming a warrior, his genius and sword are alike formidable. In battle, previously to the invention of fire-arms, such a man was the terror of his enemies and the hope of his friends. Ulysses, as sketched by Homer, is as fairly the *beau*

ideal of this temperament, as Hercules is of the thoracic. That chieftain was alike wise to counsel, intrepid to dare, and powerful to perform. Plato, so called from the uncommon breadth of his chest, who had also a very large head, is another excellent model of the same. Even in times of peace the corporeal attributes of a man of this description add to his influence. Jupiter, the emblem of wisdom and power, as represented by the ancient statuaries, with an immense head and trunk, and arms of matchless strength, is as finished a specimen of the encephalo-thoracic temperament, as Apollo is of the mixed.

From what has been said of the encephalic and thoracic temperaments, separately considered, the tendencies of this to disease, as well as the diseases when they occur, must be so obvious as to render it needless for me to specify them. The temperament being mixed, so must be its maladies; and they must correspond to it. Their usual seat are the brain and thoracic organs; and they are of high excitement. In the treatment of them the employment of the lancet must be bold.

I cannot refer to any place where this temperament prevails much more than in others. I have seen it most frequently in the mountain region of the United States. Among the people of Great Britain and Ireland it is oftener found than among those of France. It is a sort of *sporadic* variety, which occurs occasionally in every country peopled by Caucasians, but is not perhaps *endemic* in any of them. It probably never appears, in full development, in individuals belonging to any of the other races of man. In an advanced age it makes an approach toward the mixed temperament, and produces an enlargement of the abdominal viscera.

6. *The encephalo-abdominal.* Here again the name bespeaks sufficiently the development, form, and character of those who possess the temperament. The head and abdomen are comparatively large, the thorax small, and the shoulders narrow. Hence the sensibility is keen, and the intellect, if not powerful, active and respectable. For the reasons given, when the abdominal tempera-

ment was considered, the limbs and person, under the present one, are round and smooth, and the flesh is soft; but, owing to the influence of a well developed brain, and nerves that correspond to it, the movements are sprightly and the air graceful. Though rarely powerful, the character is attractive. This is the temperament of childhood and woman, much more than of adult life and man. Fine genius, but elegant and playful, rather than strong and brilliant, is often connected with it. It is females, in whom the encephalic development is larger than usual, that possess minds truly masculine.

This temperament, in a certain degree of development, is more common than either of the others. It prevails in every country peopled by the Caucasian race. As already stated, it belongs to women* and children, and

* The strength of the abdominal temperament, in females, is increased by pregnancy. Hence the well known fact, that the predisposition in them to pulmonary consumption and other thoracic affections is weakened, and the complaints themselves often suspended, during the period of gestation.

also to the advanced life of those, whose temperament during manhood was the encephalic. Like its constitution and character, its complaints are mixed, partaking of those of the two simple temperaments of which it is composed. Owing probably to the delicacy of the organization of the nerves and brain, and the high degree of life possessed by those parts, the amount of sensibility, under this temperament, is often more than in proportion to the extent of cerebral development. Such cases are easily explicable. In giving strength of function to the brain, higher *intensity* stands in lieu of greater *extensity;* a phenomenon of which no one versed in physiology can be ignorant. Under this temperament, diseases, originally abdominal, have an unusual tendency to attack the brain. Hence the frequency of puerperal madness, and the uncommon liability of women to suffer delirium in cases of peritonitis. For the same reason hysteria is almost exclusively a female complaint. Its origin is abdominal; and it falls on the brain and spinal cord by

metastasis or sympathy. In the treatment of most diseases connected with this temperament, free secretion from the viscera of the abdomen is peculiarly useful. The liberal employment of the lancet and of leeches is likewise often indispensable.

7. The *thoracico-abdominal.* In this temperament the head is comparatively small, and the thorax and abdomen large, with a corresponding size of the muscles and bones, and much adipose substance. It is the temperament of mere animal strength and patient endurance, without any of the elevated, sprightly, or attractive qualities of human nature. It forms good labourers and fatiguemen, but is entirely unfit for those whose province is to meditate, plan, and direct. It comports well enough with the character of soldiers of a certain description, but is altogether out of harmony with that of an officer. It is, I think, more favourable to health than any of the other temperaments, except perhaps the mixed. If those who possess it have weak intellects, their passions are usu-

ally moderate, and rarely hurry them into pernicious excesses. The tenor of their lives is but little interrupted by either irregularity or disease. Hence they retain their vigour uncommonly well, and are often day-labourers and industrious husbandmen at an advanced age. True; their appetite for food is strong; but they are not prone to an excessive indulgence of it; I mean at a single meal. Like those possessed of the abdominal temperament, they eat often rather than superabundantly at once. Besides, such is the strength of their chylopoetic viscera, that they subdue and digest, without sustaining any injury, as much food as would produce disease in those of different constitutions. Nor are they so much endangered by vascular fulness as persons of the simple abdominal temperament. The reason of this is plain. Their blood vessels are larger, and their excretions more copious, especially those by the skin and the organ of respiration. From the warmth of their constitutions, owing to an abundance of well arterialized blood, and a

concomitant vigorous circulation, they perspire freely, and secrete and exhale copiously from the lungs. This temperament is rarely found among women, and is not very common among men. I have not often seen it in natives of the United States. In Germany and England it is more frequently met with. It is said to prevail more in Asia and Africa than in Europe or America. On this point my information does not authorize me to speak confidently. Considerations however are not wanting to render the statement probable. Under this form of constitution idiotism, or an approximation to it, is not very unusual.

I have already adverted to the fact, that, at certain periods of life, one temperament passes into another, as the result of the natural changes which take place, in the progress of the growth and decay of the human body. This is true of every individual, but of some in a much more striking degree than of others. The subject is so interesting, and yet so little noticed, that it might seem to have

something of novelty in it. I trust therefore that a succinct but general view of it will not be unacceptable to the reader.

Like every thing else in nature, the system of man is never stationary. From birth to death it presents an uninterrupted succession of changes; and death itself is but another change. Nor are these mutations alike in every part of the body, at the same time, being much greater in some organs than in others. Hence the balance of the system is perpetually varying, a circumstance tantamount to the interchange of temperament referred to. During growth, those parts which are first and most wanted in the general economy of the body increase most rapidly; and decay observes, in its progress, somewhat of a reversed order. Parts decline in vigour earlier or later, according as their functions are more or less indispensable to animal existence; those least necessary decaying first.

At birth, the head and abdomen being disproportionately large, and the thorax narrow, the temperament of the infant is the encepha-

lo-abdominal. But it is the *animal organs* of the brain alone that are largely developed, the knowing, moral, and reflecting ones being yet small. Hence the character of the individual is also animal. The appetite is keen, the functions of digestion, assimilation, and nutrition vigorous, and the sensibility great. It will be understood that I allude to *mere animal sensibility*, not to that of a higher order. Knowledge therefore is very limited; and there is an entire destitution of reflection and moral sentiment. The complaints of this period are cephalic and abdominal, being very rarely seated in the thorax.

Until the commencement of puberty, the head continuing to grow, while the abdomen becomes comparatively smaller, the change of temperament is toward the encephalic. The enlargement of the brain, however, during this period, arises chiefly from the growth of the knowing organs, the moral and reflecting ones increasing much less rapidly. The child now seeks the elements of knowledge with great ardour, and attains them with ease;

but he is less attentive to the relations of things, and less fitted to acquire a knowledge of them. Nor is he yet a moral agent. His animal sensibility is still great, and shows itself in frequent bursts of passion. His complaints lose somewhat of their abdominal character, and become gradually more encephalic.

At puberty the development of the moral and reflecting organs, together with that of the amatory one, takes place, and the chest and its contents are expanded in every direction. In the female the capacity of the pelvis and the bulk of its organs are also enlarged. But the abdomen loses still more in its comparative size. This change is toward the encephalo-thoracic temperament. It is now that the thirst for enterprise and exploit is awakened, military life is perhaps strongly coveted, the passions become more stormy, the youth who was lately devoted to study, and perhaps fond of tranquility, is now burning for action; and a leading object of his ambition is to become a favourite of the fair.

Moral sentiment and the reflecting faculties are now possessed by him; but they are still liable to be occasionally overruled by animal propensity. His diseases are thoracic and cephalic. Madness, Peripneumony, hemopthisis, and pulmonary consumption make a part of them. Before puberty these complaints are very rare. This state of things lasts from the fourteenth or fifteenth to the twenty-fourth or twenty-fifth year of life, or a little longer.

Young manhood has now arrived, and its temperament is an approach toward the "mixed." The several parts of the body are becoming as well balanced as they will ever be, and so is the cast of character which accompanies them. The system now attains its perfection, and is comparatively settled and stable in its economy. The changes it sustains are much less striking than they had been at any previous period; and its diseases are less frequent and numerous, and less confined to any given part. They are the prevailing diseases of the community, and not

such as arise from any constitutional peculiarity. Under suitable precautions, this is the healthiest term of life; and it extends to the fortieth or forty-fifth year. It includes therefore not only the beginning, but the maturity of manhood. Uniting with it a few of the last and ripest years of juvenescence, it is then, in the fullest meaning of the terms, the period of high enterprise, daring, and efficiency. If man is ever to become great, manifestations to that effect have been made by the time he has attained his twentieth or twenty-first year; and from that epoch his character is rapidly developed. Creation is comparatively new to him. He has hitherto met with no obstacle to depress his spirit, or abate his ardour. His ambition for attainment and exploit is therefore eager and unlimited, he is untrammeled by prejudice, his hopes are buoyant and his perseverance steady, and his faculties, fresh and vigorous, are capable of exerting themselves to the extent of their nature. The exceptions to this statement, if any exist, are very few. A long cata-

logue of names, which adorn history, might be readily cited in proof of it. Such are those of Cyrus, Xenophon, Phocion, Alexander, Scipio, Cæsar, Lorenzo de Medicis, Turenne, Pope, Dryden, Voltaire, Pitt, Fox, Napoleon, Washington, Jefferson, Hamilton, Byron, and hundreds of others well known to fame. All these were becoming illustrious by or before their twenty-first year. Nor is the rule less applicable to philosophers, than to statesmen, poets, and military commanders.

No error is more obvious, and few more pernicious, than that which attaches greatness and practical power only to the meridian and the decline of life. It often excludes young men from places, which they would not only fill with lustre, but which they are alone fitted to fill. For there are stations of high importance to the welfare of man, to which the fixed and unbending habits of age, and even of ripe manhood, are not well suited. Dark and flowing locks are no more emblems of the want of wisdom and efficien-

cy, than gray hairs or baldness are of the possession of them. Society has suffered so severely from the contrary belief, that it is time it were discarded, and reason and experience introduced into its place. True wisdom can be no more measured by years than by gallons. It is the offspring of genius, trained by observation and sober reflection. Nor, when genius is of a high order, and of the requisite cast, is it necessary that the training should be very protracted. Wisdom then would seem to be instinctive.

About the fortieth or forty-fifth year of life, another constitutional change takes place, in which the prevailing temperament assumes gradually somewhat of the abdominal. A weakness of the digestive organs, which had previously prevailed, now disappears, and the general health is improved; a greater fulness and rotundity of the abdomen follow, and the keenness of feeling and the activity of talent, more especially the brilliancy of imagination, begin to abate. Man descends gradually though perceptibly from the point

of elevation he had antecedently maintained. In very advanced years, the abdominal temperament is complete, and the individual has sunk to a monument of animality.

It appears, then, that every one, who attains longevity, partakes, in the progress of growth and decline, of five temperaments; the purely abdominal, which prevails before birth; the encephalo-abdominal, which exists at birth, and for some years afterwards; the encephalo-thoracic; the mixed; and the abdominal of real senility, which differs somewhat from that of the fœtus in utero. Thus passes the circle of life, beginning with the abdominal temperament of the fœtal state, and terminatiag in that of extreme old age.

Such, in brief, are the views I have entertained and taught for several years, respecting the foundation of human temperament, and the causes that diversify it. If they are correct, time will ratify them, and further observation fill up the outline I have endeavoured to sketch. In that case, like all other truths, they will prove useful. But should they be

found erroneous, they will only share the fate of the thousand perishable fancies that have preceded them, and no one will regret their subversion less than myself. My attachment is to facts, not to hypotheses, however ingenious or splendid they may be, or by whomsoever erected. As relates however to the views I have just delivered, I may be permitted to observe, that they are not built on any thing imaginary. They do not rest on visionary conceits respecting humours or their conditions, or respecting any properties of matter, that have no existence. They have a tangible basis that can be approached and examined. The size, both absolute and relative, of the ruling organs of the body can be readily ascertained. So can the constitutional characters of individuals. And if, in the same persons, certain modifications of the organs and their relations be found always to coexist with certain corresponding modifications of character, the ground of belief will be very strong, that they are connected with each other as cause and effect. The entire

subject, therefore, is free from abstraction, and open to observation, and can be settled as easily as any other in medicine. A few practical remarks, which seem warranted by the views that have been given, shall close this essay.

According to the representation made of them, all the temperaments, except the "mixed," are so many predispositions to disease; some of them indeed much weaker than others; but still predispositions. When they are so strong as seriously to endanger health, can they, by any process within the reach of human means, be so changed, as to come nearer a mutual balance, and be less dangerous?—I think they can, provided the effort be commenced at the proper period, skilfully conducted, and duly persevered in. As in every other case, the remedy, as well as the mode of administering it, must be suited to the character of the evil to be removed. A thorough knowledge of the subject, therefore, and judicious management are essential to success.

Does it appear, from the size of his head, the precocity of his intellect, and the slenderness of his frame, that a boy possesses the encephalic temperament in a dangerous degree? Let an attempt be made to change it, as far as possible, into the encephalo-thoracic. Nor are the principles that are to govern the effort obscure. The boy is highly sensitive and passionate, inclined to be inordinately sedentary, and to over-exercise his brain in pursuit of knowledge. Let him be kept as tranquil as practicable, by a careful avoidance of all causes that might excite feeling into passion, and let his daily occupations be such as may exercise his brain less and his muscles more. Let him be less of a student and more of a labourer. In a particular manner, let him spend a considerable portion of his time in some amusement or occupation that will give full exercise to the muscles of his arms, shoulders, and chest. This will exercise, at the same time, his lungs and heart, and will tend to give expansion and strength to the whole. The pulmonary sys-

tem may be further strengthened by the practice, judiciously regulated, of singing, declamation, and playing on the flute, clarinet, or some other wind instrument of music. The mode adopted by Demosthenes to give strength to his lungs is known to every reader of Grecian history. The late Professor Rush stated in his lectures, a short time before his death, that, in a long life of medical observation, he had never known pulmonary consumption to occur in a teacher of a singing school, an auction-crier, a watchman who called the hours of the night, or an oysterman, who proclaimed his vocation through the streets. But these exercises must be skilfully apportioned to the strength and condition of the organs which they are intended to invigorate.

It is a well known principle, in the economy of living matter, that organs duly exercised grow more rapidly, attain a greater bulk, and are more hardy and vigorous than those that are allowed to rest. They attract a portion of blood, and appropriate to themselves

a quantity of nourishment, that would otherwise go to augment the growth and add to the vigour of the quiescent organs. By the process indicated, then, the chest will be enlarged, and, instead of a dangerous encephalic, the temperament may be changed into a safe degree of the encephalo-thoracic. As constipation of the bowels usually attends such cases, and aids in directing the blood toward the brain, the means of removing it should never be neglected. If the end can be attained by diet and regimen, instead of medicinal articles, so much the better. But in relation to this point, different individuals will require different modes of treatment; and a knowledge of different cases can alone suggest the necessary variations. Nothing can be more erroneous, or more certainly injurious, than for a person, whose temperament is dangerously encephalic, to pursue a sedentary and studious, or an indolent life. Either will entail on him disease and wretchedness. Be his standing and condition what they may, he had better be a ploughman, a car-

penter, or a blacksmith. Frederick III had probably in view some one possessing a highly finished encephalic temperament, when he declared that "man is better fitted to be a postillion than a philosopher." It should never be forgotten that, to prove effectual, the mutative process should be commenced early in life, and persevered in until manhood. It is only when the individual is young and flexible, that his constitution can be changed by training. It is the twig and the sapling that can be bent, and made to assume the desired form; the full grown tree resists. As already stated, however, there are particular periods in the life of man, when nature herself changes, to a certain extent, one form of temperament into another. Those are therefore the points of time, at which artificial efforts to the same effect will more certainly avail. Hence they should be always selected as the most suitable occasions for energetic action. At puberty the change which nature makes is more particularly toward the thoracic temperament; she

makes also a slighter one toward the encephalic. At this period therefore let art assist her, in the attainment of one or the other, as the case may require, and the probability of success will be the greater.

Is the abdominal temperament to be changed? Let the effort be to convert it into the "mixed." Nor is the process best calculated to effect this either obscure or doubtful. Excite and exercise, in the requisite degree, the brain and muscles, especially the muscles of the upper extremities and the chest, and the work is done. It must be recollected that in every case where the muscles of voluntary motion are sufficiently exercised, so are the lungs and heart. The same means therefore tend to enlare and strengthen the whole.

Does a desire exist, on account of the dangerous smallness of the chest, to alter the encephalo-abdominal temperament? Train. by the proper excitement and exercise, the thorax, heart and lungs. Nor let it be forgotten, that an essential part of this process consists in respiring free and wholesome air. To

resort daily therefore to the hill-top and the mountain, and spend as much time as may be convenient in those elevated situations, is a salutary practice. The exercise of ascending them will cooperate with their wholsome atmosphere, in producing the wished-for change in the system. Is the thoracico-abdominal temperament to be modified and improved? Exercise the brain judiciously, so as to render it constantly a centre of fluxion, and, as far as is practicable, the end will be attained. In fine, give exercise to the part deficient in size and vigour, and rest to that whose growth is exuberant, and nothing further can be done to equalize temperament and secure health. Even when the different compartments of the brain are disproportioned to each other, this process, skilfully performed, can do much to produce an equilibrium and improve character. Does the mixed temperament prevail? but is it accompanied by inordinate general debility, without any apparent local complaint? The remedies consist in nourishing diet easy of

digestion, well regulated exercise, and the breathing of a pure and wholesome atmosphere. To these add, suitable clothing, from six to eight hours' sleep, between nine or ten o'clock at night, and five or six in the morning, on a hair matress rather than a feather-bed, and a due governance of the passions, and the constitution will be invigorated.

If the principles contended for in this essay are true, the deductions from them are of high interest, and their practical application peculiarly important. As respects both physical and moral evil, man holds under his own control much more of his destiny than he is generally believed to do. He can so alter and rectify an unbalanced condition of his system, as to escape a large share of both, to which he would otherwise be subject. For a want of the requisite balance between the different compartments of the brain predisposes as certainly to eccentricity, immorality, and vice, as a similar want between the other parts of the body does to disease. And, in both cases, education, wisely planned and

skilfully conducted, can do much to remedy the evil. But not such education as now prevails. If that prevents some evils and removes others, it produces, in many instances, an equal number. The reason is plain. Its plan is bad, and its execution no better. Nor can it be amended, in any respect, until it shall be placed under the direction of those who have a competent knowledge of human nature. Education, correctly interpreted, is the proper training of the entire person; the exciting, developing, and strengthening, by suitable exercise, every organ belonging to the body. By such a scheme of discipline alone can man be raised to the efficiency and perfection of which he is susceptible. Let the intellectual and moral compartments of his brain be duly exercised, each according to its nature, and they will acquire such development and vigour as to control his animal. This will render him enlightened and virtuous. But never can the cause of either knowledge, or virtue, or religion be promoted, by punishment, denunciation, or terror.

Yet these means, cruel in their nature, and degrading and deleterious in their effects, are extensively employed. Let the other organs of man's body be trained with judgment and skill, and the process will exempt him from many diseases, and confer on him a degree of muscular energy, sufficient for his wants or reasonable wishes, and far beyond what he would otherwise possess.

For the attainment of an end so peculiarly desirable, the means are equally simple and obvious. Place the business of education, where it ought to be, among the most honorable and profitable employments, and the work will be done. Talents of the highest order, united to the requisite knowledge, and all other suitable qualifications, will then be engaged in it, and the issue will soon appear in a striking improvement of the educated portion of the human race. Teachers of this description will not submit to be controlled by authority because it is ancient. They will not conform to it unless it is sound. Nor, to determine this point, will they look to usa-

ges or listen to dogmas transmitted to us from times of ignorance and superstition. They will examine human nature, under the brighter lights which now surround us; and to that alone will they accommodate their schemes of instruction. They will study first the constitution of man *as it is;* and having attained a competent knowledge of that, they will then commence, under correct views, and with suitable arrangements, the great work of regulating, changing, and improving it. The scheme for effecting this will be devised and conducted in strict conformity to the laws which govern it physically, morally, and intellectually, giving to the higher a due ascendency over the lower; not in obedience to practices derived from ignorant and semi-barbarous times, nor to the mistaken conceits or superficial notions of incompetent teachers. It is because the process is not understood, that the plans of education are now so numerous, different, and even opposite. All men possess the same faculties, although in different degrees. Human nature is there-

fore *one;* and so, in its principles, will be the *true* system of training and instruction, as soon as it shall be established. With the requisite modifications, as to form, extent, and administration, it will be adapted alike to all persons, and all purposes. Such, I repeat, is the issue, to which the principles maintained in this essay, provided they be true, are calculated to lead. Persuaded therefore that they are so, I submit them to the public, with a hope that they will be useful.

THE END.